EDITORIAL

Truck Outlook Good

THIS has been a big truck year.

In ten months of 1925 the industry produced 45,243 or 12 per cent more commercial vehicles than during the entire year of 1924. Production of trucks has to hold up only to an average of 27,500 for the last two months in order to bring the 1925 total to a point 100,000 in excess of the 1924 performance.

Since 1924 had the largest truck output up to that time, this year's record will be something like 26 per cent ahead of the best previous mark.

Ford is responsible for a good share of the increase, but other makers have shown substantial gains as well. Leaving Ford out of the picture, the best showing has been made by the 1-1½ ton vehicles, but in practically every tonnage class the ten months' total for 1925 exceeded the 1924 twelve-month total.

And 1926 looks like an excellent year for truck sales. General business conditions are almost certain to continue good and some of the difficulties which may beset certain phases of the passenger car field do not seem to be present in the truck market. The truck field has, of course, its special problems, but there isn't any indication that these truck problems are going to be any more acute next year than they have been in the highly successful twelve months about to be completed.

Contentment and Activity

TO say that the human element is the most important factor in business success is trite—very trite. In the last ten years everybody has come to saying it and a few even to operating as though they believed it. Still thousands of orders are given, thousands of plans are laid, and thousands of theories are spun every month which do not take into account that trite, though true, conception.

"The balance sheet is, in the last analysis, simply a reflection of human reactions" an executive said to us the other day, and added, "The typical executive starts with the stock market or the balance sheet and spends an infinite amount of time thinking about those by-products of his business, failing to realize that fact —that the balance sheet is simply a reflection of human reactions."

To keep men stimulated as well as contented; that is the difficult fundamental problem of management. Men on an executive staff may be thoroughly contented with their jobs and at the same time be thoroughly unprogressive and dull. They must be mentally active to be useful; and mentally active men often are discontented. A difficult problem to be sure, but one which has been solved by those organizations which have built the most permanent successes.

Rates and Terms

"RATES" were the chief topic of discussion at the recent finance company association meeting in Chicago. "Terms" were somewhat in the background. That was natural because rates are to the finance company what prices are to the automobile maker; the finance company must have rates high enough to permit a profit or go out of business.

But the emphasis now being placed on rates throughout the finance field should not obscure the fact that fundamentally terms are the really important thing to car manufacturers. If rates get so low as to drive many finance companies out of business, a temporary shortage of money for financing retail sales might result; but higher rates again would follow as a result of demand and more companies would come back into the field again. But if terms become far too liberal for safety, the dealer and the manufacturer, as well as the finance companies are likely to get very direct and adverse effects. The possibilities of adverse economic effects as a result of improper terms are far greater, it seems, than of improper rates, at least so far as the vehicle manufacturer is concerned.

Corrugated Light Bulbs

THE corrugations in the glass bulbs of the new double filament lamps for automobile headlights have aroused considerable curiosity as to their function.

With a plain glass bulb, the forward half is semispherical and the inner surface acts as a reflector, throwing back about 10 per cent of the light, the remaining 90 per cent passing through the glass and striking the road. This reflected light forms an image, or secondary source of light, of about two candlepower intensity at the center of the bulb.

In the single filament bulb, the filament is located at the center and consequently the image coincides with it and does not have any undesirable effects. In the double filament bulb, however, the filaments are offset from the center. As a result, the two candlepower image formed with a plain bulb would be located on the opposite side of the center. In this position it obviously would interfere with attaining the desired distribution of light on the road.

The corrugations in the bulb break up the reflections and prevent the formation of this image, thus avoiding the difficulty.

AUTOMOTIVE NEWS SECTION INDUSTRIES

Philadelphia, Pennsylvania

Thursday, December 3, 1925

Dealers' Stocks and Used Car Market Watched by Industry

PHILADELPHIA, Dec. 2—With sales showing the normal seasonal decline in November, although continuing well ahead of the level of the same month last year, attention was concentrated on the relation of production to dealers' stocks and of the mounting used car market to the sales position of the industry. The tendency definitely was to increase new car stocks in dealers' hands, but some opposition to this program developed late in the month when it was seen that Congress probably would not make the tax reduction on automobiles and trucks effective on vehicles in the hands of dealers March 1, when the new tax bill is expected to be in force. The dealers thus felt themselves faced with the possibility of having to absorb the 2 per cent difference between the old and the proposed new rate. Efforts are, however, being continued at Washington to have the reduction made retroactive.

The outstanding features of the current situation may be summarized as follows:

1. Production has been cut materially but has continued well ahead of sales.
2. Dealers' stocks, therefore, have increased considerably, to such an extent that already some of them may be more than well supplied for the new year.
3. Used car stocks in many important sections are at about the highest point they have ever reached.
4. In some sections repossessions are on the increase and are tending to aggravate the unsatisfactory state of the used car market.

Automotive Sentiment Cheerful

Notwithstanding these conditions which may fairly be termed unfavorable, sentiment in the automotive production centers is extremely cheerful, and the opinion is widely expressed that the opening of the Spring sales season will see the market once more on an entirely satisfactory basis. With business generally on the up-grade, cars lower in price and better looking than ever, and foreign sales expanding, it is felt that 1926 distribution should at least equal that of 1925.

Yet here and there the statement is occasionally made that price cuts, the easy financing terms, and the duo-tone colors of the current year have overstimulated the market and brought in buyers that otherwise would not have purchased cars until next year. This question appears to be one that only 1926 can answer.

The used car mraket continues to be the key to the whole situation. Special sales of these vehicles now being held in various parts of the country, even where successful, do not show profits. Dealers and distributors are working on the principle that the price must be of sufficient interest to catch the buyer and are following out this idea regardless of

(Continued on page 965)

November Car and Truck Output 379,300

December Need Produce But 90,000 to Make Year's Total a Record

NEW YORK, Dec. 3—November production of cars and trucks was 379,300 units, according to the preliminary estimate of the National Automobile Chamber of Commerce. This compares with 452,392 in October, a reduction of approximately 16 per cent, but is more than 60 per cent above the November, 1924, mark of 232,248 units.

The total for 11 months of 1925 stands at 3,997,954, and a December output of only 90,000 vehicles will be sufficient to better the all-time high production mark set in 1923 with 4,086,997 cars and trucks.

A marked curtailment is expected during the current month, with many factories closing down for inventories and to prepare for model changes. But the total output should be around the 300,000 mark or slightly lower.

Gilmer to Increase Line

PHILADELPHIA, Dec. 1—L. H. Gilmer Co., manufacturer of automobile fan belts, is installing new machinery for making its rubber belts in order that all processes from the raw material to the finished product may be carried out in its plant under its own supervision. In addition to flat and V type fan belts, this concern makes a variety of belts of both rubber and fabric.

"FINANCE WAR" WAGED IN CALIFORNIA TRADE

LOS ANGELES, Dec. 2—Of outstanding importance in the Southern California market is the return by virtually all dealers to a maximum 18-month time payment plan, after a vertiable "finance war" between various leading distributors, which was climaxed when one distributor offered 27 months. It is known that several factories "requested" their Los Angeles distributors, who had extended their payment periods to meet competition, immediately to return to a maximum 18-month basis.

Officers of the leading finance companies in Los Angeles, realizing that, unless they shortened the payment periods, serious business reverses would occur in Southern California automobile merchandising, because the used car was losing its market, called a meeting and agreed to make 18 months the limit. One Los Angeles distributor, who is credited with having started the "time payment" war still features the same low down-payment, however, but necessarily has increased the amount of monthly payments owing to the contraction of the payment period.

It is generally agreed by Los Angeles distributors that competition this year in Southern California is the keenest on record, and that, if the "time payment" war had continued, there undoubtedly would have been serious business consequences. Now that the situation has been relieved, the outlook for the remainder of the Winter in this territory is considered very favorable.

N. A. C. C. to Arrange Truck Makers Meeting

NEW YORK, Dec. 2—A convention open to all motor truck manufacturers will be held by the N. A. C. C. at its New York headquartes on Monday, Jan. 11, during Automobile Show week.

The morning meeting will be merged with the opening session of the Second World Motor Transport Congress at Hotel Roosevelt, where a luncheon will be served at which the use of motor vehicles at home and abroad will be discussed. The program for the afternoon meeting at the N. A. C. C. headquarters will be announced soon.

Windsor T. White is chairman of the Chamber's motor truck committee and Edward F. Loomis is secretary.

Tax Bill Now Provides Rebate

House Ways and Means Committee Agrees to Insert New Provision

NEW YORK, Dec. 3 — Automobile manufacturers will seek no further reduction in the tax on passenger cars in the bill now being prepared by the House, Ways and Means Committee. While maintaining the principle that automobiles are necessities rather than luxuries, and should not be submitted to Federal taxation, they have decided to discontinue their efforts to remove the remaining 3 per cent tax on passenger cars in return for certain concessions from the committee.

The committee has agreed to insert in the bill a provision under which the 2 per cent reduction on passenger cars will not be effective until 30 days after the passage of the act. The committee has also agreed that the bill shall provide a rebate equalling the amount of the tax reduction on all cars in the hands of dealers at the expiration of that time.

Law May Pass March 15

WASHINGTON, Dec. 3—Present indications are that the law will be passed by March 15. This would mean that the relief on the passenger cars would not begin until April 15. Under the agreement dealers and agents would then be permitted to apply for a refund of the tax they had paid on passenger cars, on hand, on April 15.

The date of the relief on truck and accessories' taxes was not altered and will be taken off on the date that the bill becomes effective.

It was explained by Chairman Green of the Ways and Means Committee to the manufacturers that the government could not afford to make the passenger tax retroactive from the date that the bill passed, but that by advancing the date of effectiveness one month it would yield approximately $7,000,000 tax to the government, and with this added yield would permit the Treasury to make a rebate to dealers who had unsold passenger cars on hand one month after the new law goes into effect.

The manufacturers participating in the discussion included H. H. Rice, J. L. Pratt, L. P. Fisher and H. H. Bassett, General Motors; F. J. Haynes and A. T. Waterfall, Dodge; S. E. Ackerman, Franklin; Alvan Macauley, Packard, and B. E. Hutchinson, Chrysler.

Study Oil Supply

WASHINGTON, Dec. 3—When asked to comment on published reports this week that the Federal Oil Board believed that the Nation's oil supply would be exhausted in seven years, and that drastic recommendations would be made to the President, Secretary Hubert Work of the Interior Department, chairman of the Federal Oil Conservation Board, explained that the Board had reached no conclusions, decided on no recommendations, and, in fact, had not yet considered any of the material supplied the Board by the oil industry.

Secretary Work explained that as soon as the Advisory Committee of the Board completes its survey of the material furnished by the oil industry, a public hearing will be held, at which those leaders of the industry interested in the Government's inquiries on our oil resources will be invited to attend and express their views with all frankness. Until this public hearing is held, the Secretary said, no policy can be determined upon.

Another Tire Price Advance Forecast

AKRON, Dec. 3—Rubber manufacturers are preparing to put into effect another increase in automobile tire prices, probably sometime this month. This will be the fifth upward revision this year, and will bring prices of casings and tubes to levels of 60 and 75 per cent above those prevailing in 1924.

While no definite announcements have been made, a price increase in the near future is regarded in rubber circles as inevitable, in view of the sustained upward trend of the crude rubber market.

Spot rubber is holding firm around $1.10 a pound, within ten cents of the highest point reached this year, and futures have been steadily advancing. Akron rubber brokers and dealers expect the market to go still higher, as the demand increases early next year for Spring requirements.

When the last tire price increase was made in September, spot rubber was around 85 cents a pound, and the actual cost to manufacturers of rubber then being used was between 55 and 60 cents. Cost of manufacturing tires is now being figured by most of the larger companies at 70 cents, and by the small concerns at 90 cents. At the latter figure there is said to be little profit in producing tires to sell at current prices.

Freight Rate Ruling Favors Car Dealers

NEW YORK, Dec. 1—J. S. Marvin, chairman of the traffic managers' conference, has sent to members of the N. A. C. C. copies of a decision by Division 2 of the Interstate Commerce Commission to the effect that, where a freight rate is found unreasonable, automobile dealers will not be estopped from reparation because they have collected freight from car buyers.

Automobile dealers at Eureka, Cal., applied for the same rates as applied to other Pacific Coast terminal points and reparation on shipments charged at higher rates. The Commission granted the rates and reparation despite the railroad's claim that the dealers had reimbursed themselves in the retail price of cars.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, Dec. 3—Trade in general continues distinctly more active than a year ago. Although the seasonal peak of wholesale buying appears to have passed, retail dealers are beginning to feel the stimulus of the holiday trade. Industrial activity continues to gain. Wholesale prices have exhibited a moderate upward trend for several weeks.

RETAIL TRADE

Retail trade showed considerably more than the normal seasonal gain in October, according to the Federal Reserve Board. Department store sales were 17 per cent larger than in October last year, and the total for the first ten months was 4 per cent larger than that of a year earlier.

CAR LOADINGS

Car loadings in the week ended November 14 numbered 1,050,758, as compared with 1,063,322 in the preceding week and 1,015,704 in the corresponding period last year. Early reports of railway earnings for October indicate that the month's total may reach a new high record.

BUSINESS FAILURES

Business failures reported to Bradstreet's for the week ended November 26 numbered 294, comparing with 382 in the preceding week and 331 in the corresponding period last year.

BANK DEBITS

Bank debits to individual accounts reported to the Federal Reserve Board for the week ended November 25 were 13.2 per cent less than the total for the preceding week, but 13.8 per cent larger than that for a year earlier.

FISHER'S INDEX

Fisher's index of wholesale commodity prices stood at 160 last week, as compared with 159 in the preceding week and 157.9 four weeks earlier. Last week's average was the highest recorded since the second week of August, and compares with the year's peak of 164.4 in January and the low point of 154.1 in May.

FEDERAL RESERVE STATEMENT

Bills and securities held by the Federal Reserve banks increased $62,600,000 during the week ended November 25. Discounts gained $58,300,00 and open market purchases $4,500,000, while Government securities declined $1,000,000. Note circulation increased $23,500,000, while deposits decreased $31,100,000 and reserves $44,600,000. The reserve ratio declined from 72.1 to 71.1 per cent.

MONEY

Money rates remained unchanged last week, call loans ranging from 4½ to 5 per cent, time loans from 4⅞ to 5 per cent and commercial paper from 4¼ to 4½ per cent. The rate on call loans rose to 5½ per cent on Monday of this week.

Foresee No Jump in Sheet Price Levels

Leading Producers Assure Customers of Steady Supplies

NEW YORK, Dec. 3—Tonnage on sheet and strip mills' order books for automotive account is of such proportions as to relieve both producers and consumers of worry over the immediate future. Its extent is sufficient to enable producers to maintain economic operating schedules during the year's remainder and in many instances a good deal of the backlog will be carried over into 1926.

On the other hand, consumers have not committed themselves beyond their conservatively estimated requirements over the current month. Leading sheet producers have assured their regular customers that they will be looked after not only in the matter of shipments, but also of price. In other words, there is to be no sudden "jumping" of price levels. If conditions shape themselves so that further upward adjustments of finished steel prices must be made, consumers will either be given an opportunity to protect themselves or advances will be graduated.

Alloy Steel Makers Prosper

Automotive alloy steel makers also enjoy a very fair backlog of orders. That part of the steel industry which has enjoyed bar orders from the leading manufacturer of low-priced passenger motor cars in the past is, of course, anxious regarding the effect which operation of that interest's own rolling mill will have on its purchases in the open market.

Sales managers of the leading steel mills are unanimous in the opinion that the growing popularity of all-steel bodies will result in much increased sales of body stock, and this opinion, in some instances, is based on surveys of prospective 1926 requirements. A new list of extras on cold-finished steel bars has been issued by producers; free-cutting stock is subject to a $2 a ton extra.

The Metal Market

Pig Iron—Uncertainty over the coke situation and continuing apathy on the part of melters are responsible for the reserved attitude of blast furnace interests.

Aluminum—Not only is there perfect harmony as to prices in the domestic market where the sole American producer's quotations are on a parity with those of importers, but the same condition seems to obtain in all of the world's markets. Advices received from London today quote the market there at £118 @ £120 as against £117 to £118 before the recent advance in the American market.

Copper—Domestic demand continues fair, but the red metal droops because of continuing lack of purchasing power on the part of the leading Continental consumers—Germany and France. Automotive demand for wrought brass and copper products is well maintained.

Tin—The Far East continues to ration the consuming markets in order to maintain the abnormally high price levels.

Lead—Slightly increased contributions to the supply by Mexico and Australia have so far not had much effect on the market, which is steady.

Zinc—Producers' views as to prices continue to dominate the market.

NEW DODGE SEDANS SHOW IMPROVEMENTS

DETROIT, Dec. 1—A number of improvements have been incorporated in the Dodge Brothers' type B, all-steel sedan, which add materially to its appearance. The body is now finished in sage brush green lacquer with a fine red stripe and the top and running gear are black.

The overall height has been decreased about two inches and a reduction in the size of the pillars has resulted in increased visibility. A one-piece windshield, hinged at the top, has replaced the former two-piece design and a cowl ventilator has been added. Rear quarter windows are operated by lever regulators instead of the crank type previously used.

Changes in the tilt of the seats make them more comfortable and the doors overlap the floor as a protection against draughts. The windows on this model are now interchangeable and the doors are hung with three hinges instead of two.

Shipments from the factory are stated to be at the rate of 400 daily.

Rickenbacker Sales Up 100% in September

DETROIT, Dec. 1—R. T. Hodgkins, general sales manager of the Rickenbacker Motor Co., stated that September shipments of that company's sixes and vertical eights were 100 per cent more than those for September, 1924.

October shows a 30 per cent increase over October a year ago, and Mr. Hodgkins added, if business keeps up in the last half of November as it has in the first half, the month would show more than 100 per cent over the same month last year.

Ford Co. is Awarded Air Mail Contract

DETROIT, Dec. 1—It is announced here that the Ford Motor Co. has been awarded a contract for transporting Government air mail between Detroit, Chicago and Cleveland, the service to start about Jan. 1.

A saving of 50 hours will be effected on mail from California to Detroit, it is estimated.

Automotive Taxes Decrease $3,400,000

October Collections Fall—July 1-Oct. 31 Still Ahead of Last Year

WASHINGTON, Dec. 3—A decrease of $3,417,458.22 is noted in the Internal Revenue collections from the automotive industry in October, 1925, as compared with those of October, 1924, but an increase of $8,103,668.61 still stands in collections from the automotive industry for the period from July 1, 1925, to October 31, 1925, as compared with the period from July 1, 1924, to October 31, 1924, it is announced here. The October, 1925, collections are given as $7,319,443.42.

A study of the collections shows that trucks, automobiles and motorcycles contributed the bulk of the $3,417,458.22 while "automobile parts and accessories" came nearest to holding their own. The October, 1924, collections from "automobile trucks and automobile wagons" is set at $580,027.97 as compared with $1,301,298.25 in October, 1924; "other automobiles and motorcycles" during October, 1925, paid $5,089,306.35 as compared with $7,468,652.72 in October, 1924, while "automobile parts and accessories in October, 1925, paid $1,650,109.10 as compared with $1,966,950.67 in October, 1924.

Repossessed Cars Upset N. C. Market

CHARLOTTE, N. C., Dec. 2—Serious disturbances of the used car market here and at other important points in this territory were attributed by dealers and distributors to the offering of repossessed cars by finance companies. This situation developed in the middle of November and, though expected in a measure, has become more serious than the dealers say they expected.

The Charlotte Automotive Merchants Association, car dealers' division, at its meeting last week, engaged in a general discussion of this problem. The tacit decision of the membership was that nothing immediately can be done to remedy the situation.

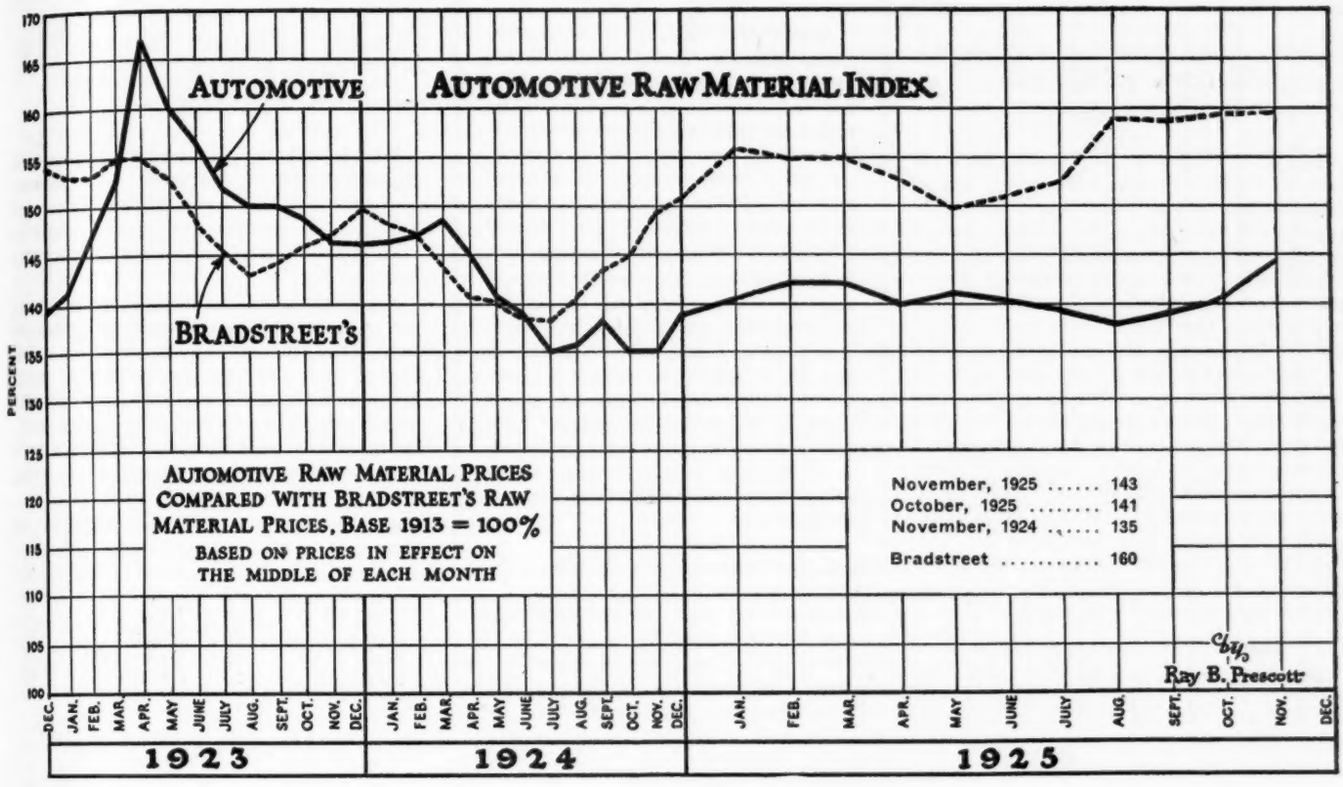
Stocks of used cars in this city are low, and the dealers are not apprehensive of loss from that source, but the condition of the used car market may have some important bearing on the volume of sales of new cars through trades involving used cars, according to several dealers.

Michelin 22% Tire Increase

PARIS, Nov. 15 *(by mail)*—Michelin increased tire prices 22 per cent this week, to take effect immediately.

In accordance with the custom here, Michelin's move was at once followed by all other tire manufacturers and importers on the French market.

November Raw Materials Continue to Climb



White Motor Forms Holding Corporation

CLEVELAND, O., Dec. 1—Real estate holdings of the White Motor Co., and occupied by branch sales and service stations throughout the United States are to be segregated under ownership of a separate corporation, according to plans announced yesterday by officials of the company.

The holding corporation is to be known as the White Motor Realty Co., an Ohio corporation soon to be organized with 15,000 shares of no par value common stock, 5,000 shares of which are soon to be issued.

Financing Plan

The new corporation will be financed by an offering of $3,000,000 6 per cent secured serial gold debentures to be floated through local investment banking houses and the Union Trust Co. of Cleveland.

The debentures will be secured by property appraised at $4,300,000, in addition to the leasehold value. Rentals on the properties will total $430,000 a year, which is in excess of the maximum annual interest and retirement requirements of the debentures.

All the capital of the realty corporation will be owned by the White Motor Co., with the exception of shares required to be owned by qualifying directors. The debentures will be paid off $200,000 annually from Dec. 1, 1926, to 1940.

The remaining 10,000 shares of capital stock will be left in the company treasury to be used later should additional financing be required for real estate extensions. The present form of financing is similar to that followed when the White Motor Securities Co. was organized to finance the company's time sales.

White Motor earnings for 1925 are expected to exceed the $4,084,248 earnings in 1924 and $3,770,716 in 1922. Earnings in 1923 were $6,964,665.

Plans Biennial Census of Manufacturers for 1925

WASHINGTON, Nov. 30—The Bureau of the Census is making plans for the biennial census of manufacturers, which will cover 1925. The blank forms upon which reports should be made will be mailed by the bureau to all manufacturers about Jan. 1, and a report will be required from every manufacturer whose gross products are valued at $5,000 or more for 1925.

The Bureau is urging the manufacturers included to furnish the information requested as soon as possible after Jan. 1, in order that it may have early in 1926 the statistics which will show the condition and record of their industry for 1925.

Evans & Co. Erects Alabama Block Plant

YORK, ALA., Dec. 1—E. S. Evans & Co., Inc., Detroit, have obtained a site near here for the construction of a plant to manufacture automobile shipping blocks. The daily output of the York plant will be about three carloads.

Oakland Organizes Used Car Division

PONTIAC, Dec. 2—Formation of a used car division of the Sales Department of the Oakland Motor Car Co. has been announced by A. R. Glancy, president and general manager. The division will be a permanent part of sales development work.

W. L. Buck, formerly field instructor in zone two for the sales development department, has been appointed head of the new division. Mr. Buck, a veteran in the automobile industry, has been in sucession salesman, sales manager, dealer, factory district manager, and in modern merchandising methods.

The primary purpose of the new department will be to watch used car stocks, and to provide individual assistance in unloading excess inventories. From time to time, the department will broadcast suggestions in keeping with the situation on hand, which are expected to be of material benefit to Oakland dealers and distributors.

Miami Buys Buses

MIAMI, FLA., Dec. 2—This city has purchased a fleet of 25 gas-electric buses, which will be used for the increased demands placed upon transportation facilities here.

The bus selected, it is announced, is the Fageol-General Electric single-deck bus, with a seating capacity of 29 passengers. A 6-cylinder Hall-Scott gasoline engine is used.

Exhibitors' Lists at N.A.C.C. Shows Long

Space Rearrangement Allows Additions to Original Number

NEW YORK, Dec. 2—The lengthening lists of exhibitors who have made space reservations in the New York and Chicago National Automobile Shows are indicative of the widespread interest that these exhibitions claim annually from the motor car industry. The lists reflect the activity that prevails in preparation for the big events and the great volume of business that will follow in 1926.

A few days ago, announcement was made that it had been found possible through a rearrangement of aisles and passageways in Grand Central Palace, to provide additional booths. Since then more than a dozen additions have been made to the accessory and parts list, one firm having San Francisco as its headquarters, an indication of the National influence of the major displays.

Elaborate Decorative Schemes

The decorative schemes for both the New York and Chicago shows are again in the hands of Samuel Asch. With S. A. Miles, manager of the two events, he has worked for the last three months to insure that the decorations will be in keeping with the importance of the occasions. They will cost approximately $100,000, and, unlike last year, no part of the New York scheme will be utilized in the Chicago Coliseum.

More interest is being displayed in the trade sessions of the National shows than heretofore. These periods will be from 10 A. M. to 1 P. M. on Monday and Tuesday at each show.

In a statement to the trade, Show Manager Miles declared: "The head of every concern in the industry and his principal representatives are entitled to admission. If you write now, your show tickets will cost you two cents—for postage. If you don't, it may cost you dollars' worth of time standing in line."

A. E. A. to Issue Specifications Booklet

CLEVELAND, Dec. 3—Announcement of the reports of the standardization committee of the Automotive Electric Association on its projected booklet on headlights and on specifications for electric equipment of motor coaches may be expected Jan. 11, according to announcement by Earl Turner, manager of the association, following a meeting here yesterday of the committee.

The reports were turned over to Mr. Turner at the meeting but they must be reviewed and approved by the directors before they are made public. The meeting was held at the Old Colony Club, Hotel Hollenden.

Among the electric experts collaborating on the reports are: Burns Dick, chief engineer of the Wagner Electric Corp., St. Louis, who is chairman of the committee; C. F. Gilchrist, chief engineer of the Electric Auto Lite Co., Toledo; T. L. Lee, chief engineer of the Northeast Electric Co., Rochester, N. Y.; F. H. Prescott, chief engineer, Remy Electric Co., Anderson, Ill., and W. P. Loudon, assistant chief engineer, Dayton Engineering Laboratories Co., Dayton, O.

OFFICIALS ON FLYING BUSINESS TRIPS

DETROIT, Dec. 2—The Continental Motors Corp. is the latest company to use airplanes to transact organization business. The route as selected by the company, according to Ross W. Judson, president, will be between Muskegon and Detroit. Landing fields have been selected at Grand Rapids, Lansing and Muskegon.

The plane to be used is a three-engined Fokker, capable of carrying fourteen passengers, and similar to the Fokker plane flown in the Ford reliability tour. It will be used to carry freight and plant officials between the plant here and the main plant at Muskegon. It is planned to have four round-trips each week by the end of February.

Hupp Nov. Shipments Triple Those in 1924

DETROIT, Dec. 1—November shipments of Hupmobiles will be approximately three times those of November, 1924, O. C. Hutchinson, general sales manager, Hupp Motor Car Corp., said today. The company will maintain capacity production on both the six and eight-cylinder models in December.

Hupp closed October with shipments which were 81 per cent larger than those for October, 1924. The list of unfilled orders on October 31 exceeded $4,000,000 worth of eights and sixes, one of the largest list of unfilled orders the company has ever had. The shipments for next month would, it was said, exceed those for October.

According to Mr. Hutchinson, the company is oversold on the new six-cylinder car and will continue to be in December. Prospects for 1925 necessitate the largest production schedule the company has ever known.

Cincinnati Railway Co. Ratifies Bus Operation

CINCINNATI, Dec. 3—Stockholders of the Cincinnati Street Railway Co. have ratified an amendment to the articles of incorporation of the company, providing for the operation of motor buses. The amendment gave power to operate motor buses, automotive vehicles and trackless trolleys, and to operate terminal buildings, garages and other equipment necessary.

G.M. Closed Car Sales Set Record

October Figure Shows 71% of All Sales—Gain Over Oct., 1924

DETROIT, Dec. 1—In the last month, approximately 71 per cent of all passenger cars sold by the different units of General Motors were closed models. This is the largest percentage so far this year.

Starting with January, the gains in the number of closed cars sold continued until May, when they showed a 2 per cent drop. The decline continued until August, when an 8 per cent increase was registered over June. Since that time, the gain has been steady. October's gain was 19 per cent more than for the same month a year ago.

Following are the percentages of closed cars sold this year:

Month	*%*	*Month*	*%*
January	47	June	58
February	54	July	54
March	60	August	62
April	61	September	66
May	59	October	71

Steel Products Co. Closes $2,500,000 Sale

CLEVELAND, Dec. 1—A contract calling for $2,500,000 in valves and tubular small parts has just been closed by Charles E. Thompson, president of the Steel Products Co., Cleveland, with a Detroit manufacturer of one of the large-production class sixes.

The chief items covered by the contract will be produced at the local plant, which will have to adopt a 24-hour schedule to complete the order. The new order puts the production schedule of the company at the highest point in its history.

Atwood Machine Co. Moves Into New Home

ROCKFORD, ILL., Dec. 1—The recently completed plant of the Atwood Vacuum Machine Co., into which they have moved, is two stories in height, and the main manufacturing part is of saw tooth construction, 144 by 200 feet. The plant is located on the Chicago, Milwaukee and St. Paul switch tracks and with the additional property acquired for expansion, has a frontage of 600 feet on the track.

The company started eight years ago with the manufacture of a patented adjustable door bumper for the automobile trade, while the main business at that time was the manufacture of stationary vacuum cleaners. About four years ago the vacuum cleaner end of the business was sold and the plant now employs about 150 people in the manufacture of door hinges, door bumpers and other specialties for the automobile body trade.

Exports, Imports and Reimports of the Automotive Industry for October of Current Year and Total for Ten Months Ended October, 1925

	Month of October				Ten Months Ended October			
	1924		1925		1924		1925	
	Number	Value	Number	Value	Number	Value	Number	Value
EXPORTS								
Automobiles, including chassis (total)	17,115	$12,424,091	22,580	$17,470,557	152,327	$110,155,819	241,044	$179,554,709
Electric trucks and passenger cars	18	244,24	18	23,844	130	168,274	100	167,928
Motor trucks and buses, except electric:								
Up to 1 ton	2,231	750,962	.....	.....	17,961	7,233,128	.....	.....
Over 1 and up to 2½ tons	419	597,825	1,082	1,130,020	4,465	6,052,120	8,226	10,118,654
Over 2½ tons	74	206,638	127	446,847	1,281	3,109,440	1,318	4,058,805
Total motor trucks and buses, except electric	2,724	1,555,425	4,075	2,936,249	23,707	16,394,688	42,421	27,985,576
PASSENGER CARS								
Passenger cars, except electric:								
Value up to $500, inclusive	5,948	2,166,023	6,085	2,185,896	51,319	18,666,514	79,217	29,014,936
Value up to $800	3,919	2,793,303	5,572	4,067,033	36,510	24,823,945	50,819	36,116,288
Value over $800 and up to $2,000	4,161	4,919,644	.....	.....	37,727	41,896,051	.....	.....
Value over $2,000	345	965,272	372	1,048,334	2,934	8,206,347	4,303	11,765,287
Total passenger cars, except electric	14,373	10,844,242	18,487	14,510,464	128,490	93,592,857	198,523	151,401,205
PARTS, ETC.								
Parts, except engines and tires (Lbs.):								
Automobile unit assemblies (Lbs.)	16,176,205	2,804,999	20,429,048	3,739,953	218,521,563	39,144,779	202,322,903	35,912,680
Automobile parts for replacement (Lbs.)	6,429,366	1,808,724	10,171,527	2,538,909	73,957,363	18,636,467	86,679,753	23,599,386
Automobile Accessories (Lbs.)	1,206,237	578,674	1,787,036	772,600	15,540,815	5,762,795	16,413,928	7,178,137
Automobile service appliances (n.e.s.) (Lbs.)	810,231	343,498	1,118,754	469,882	5,786,415	2,328,404	10,925,337	4,409,982
Station and warehouse motor trucks (No.)	9	2,192	11	5,280	126	77,100	226	168,205
Trailers (No.)	63	26,359	37	30,842	472	172,520	458	226,123
Airplanes (No.)	5	59,000	2	29,477	54	358,677	71	359,353
Parts of airplanes, except engines and tires (Lbs.)	6,372	5,516	5,663	1,060	162,269	162,040	93,694	111,848
BICYCLES								
Bicycles and tricycles (No.)	603	13,550	360	11,378	5,728	142,813	6,267	167,504
Motorcycles (No.)	1,339	306,881	2,140	454,289	13,585	3,281,402	18,449	4,138,500
Parts, except tires (Lbs.)	185,267	116,581	176,712	112,049	2,424,767	1,327,228	2,445,821	1,383,826
INTERNAL COMBUSTION ENGINES								
Stationary and portable:								
Diesel and Semi-Diesel (No.)	228	29,958	375	152,085	1,571	460,456	1,080	589,874
Other stationary and portable:								
Not over 10 H.P.	2,948	253,535	2,355	202,566	20,966	1,911,677	23,807	2,055,554
Over 10 H.P.	106	131,244	215	175,662	2,015	1,392,279	2,234	1,882,869
Automobile engines:								
Motor trucks and buses	40	10,859	1,492	128,202	1,045	149,712	38,899	3,310,883
Passenger cars	920	167,359	4,682	667,481	16,796	2,694,695	92,470	10,461,941
Tractors	24	14,909	189	58,042	2,366	731,873	1,342	555,168
Aircraft	11	14,800	4	16,635	144	217,999	57	145,084
Accessories and parts (Lbs.)	787,963	289,463	671,555	312,548	7,069,223	3,050,021	7,531,891	3,452,620
IMPORTS								
Automobiles, including chassis (dutiable)	57	56,967	63	63,982	504	706,036	529	868,879
Other vehicles and parts for them (dutiable)	.....	84,516	.....	124,085	.....	899,970	.....	680,949
REIMPORTS								
Automobiles (free from duty)	91	180,887	15	29,243	465	686,039	172	249,904

Banks Fail to Aid Car Maker Abroad

NEW YORK, Dec. 2—Robert C. Graham, director of the commercial car and truck division of Dodge Bros., Inc., and vice-president of Graham Bros., returning last Friday on the Aquitania from a trip abroad, in discussing business conditions abroad, said:

"Business conditions in the British Isles are better than reports that have reached the United States would indicate.

"One thing that was especially impressed on me was that commercial banks in Europe do not give the automobile business the cooperation that is accorded by American banks. One of the secrets of the great growth of the motor industry in the United States is the helpful attitude of the banks towards the business. The industry in Europe would be greatly aided by a change of tactics on the part of their banks.

Mr. Graham said that Graham Bros.' estimated production for 1926 called for 40,000 cars.

Wilkinson Builds New Car

SYRACUSE, N. Y., Dec. 2—Details of the new Wilkinson six-cylinder water-cooled car, made by John Wilkinson, former chief engineer of the H. H. Franklin Automobile Manufacturing Co., are to be announced soon. The Wilkinson four water-cooled car has already been produced, but nothing has been determined as to when this machine or the six will go into production.

Mr. Wilkinson says that his four-cylinder car can be produced in quantities to retail well below $1,000, while the six may be from $200 to $300 more.

The six-cylinder has a wheel base of 114 inches, with a 3 x 4 engine of 50 h.p. Mr. Wilkinson will have a special four-door sedan body built for the experimental six.

N. E. Electric Begins Equipment Manufacture

TORONTO, Dec. 1—The North East Electric Co. of Canada, Ltd., has begun the manufacture of North East starters, generators and ignition equipment. The company will supply electrical equipment to car manufacturers of Canada who are using North East products as standard.

The new company occupies the entire building that formerly housed the Canadian branch of North East Service, Inc. In addition to the manufacture of equipment, it will take over the service work in Canada formerly handled by the Toronto branch. J. W. Neun, who was formerly manager of the Toronto branch, is in charge of the new company.

Ostby Becomes Vice-President

NEW YORK, Dec. 2—Oscar F. Ostby has become vice-president and general sales manager of the Burnoil Oil Burner Corp., 56-58 West 45th Street. He was formerly general sales manager of the Prest-O-Lite Co.

Automotive Division Active in 1925

WASHINGTON, Dec. 3—Continued expansion and improvement of the facilities of the automotive division, with improved export statistics and informational services, is reported by Secretary of Commerce Hoover in his annual report just made public here.

Reviewing the activities of the automotive division during the fiscal year ended June 30, 1925, Secretary Hoover points out that representatives of the division visited more than 50 automotive plants and conferred with executives at Detroit, Cleveland, Toledo, Pittsburgh, Philadelphia, Cincinnati, Chicago, St. Louis, Indianapolis, South Bend, Lansing and Springfield, O.

New Cheap Foreign Cars Out

WASHINGTON, Dec. 1—Several Austrian manufacturers have announced new low-priced models within the last few weeks, the automotive division of the Department of Commerce is informed.

Among these are the 1½-liter Steyr, with a list price of $1,890 for the open touring model; the new Fiat 509, listed at $1,570, for the touring car; and a light two-cylinder air-cooled car manufactured by the Czechoslovak Tatra Works in Nesselsdorf, to sell for $1,270. The Austrian "Perl" works, manufacturer of a popular taxicab, has also announced a new cheaper model.

Men of the Industry and What They Are Doing

Horton Heads New Division

Percy E. Chamberlain, sales manager of Nordyke & Marmon Co., has announced that the company has established a used car division of the sales department, with H. M. Horton of Albany, N. Y. as manager. Mr. Horton has been a retail salesman and a sales manager, and has a wide experience. His first work in the new division will consist of an extensive survey and study of used car parts of the country.

"The dealers," says Mr. Chamberlain, "have been wondering when the automobile factories would take steps to aid them in handling the used car problem which is allied with production and distribution. While some attempts have been made by makers to aid in the problem, the general inclination has been to place the cart before the horse. We do not believe that dealers can carry out factory used car policies unless these are founded upon a complete analysis of conditions as they actually exist in the field today. It is vitally essential in our opinion that to make proper plans for such work factories must make more thorough study and investigation of field conditions than has been the rule."

Olsen 80 Years Old

Tinius Olsen, founder of the Tinius Olsen Testing Machine Co., of Philadelphia, will be honored at a party given Dec. 7 by Mr. and Mrs. Thorsten Y. Olsen on his eightieth birthday.

G. M. EXECUTIVES TO SAIL

Headed by C. S. Mott as chairman, a party of General Motors executives composed of John T. Smith, H. L. Barton, M. L. Prentis and W. J. Davidson, will sail December 5 for England and Europe to look after business pertaining to General Motors both in England and the Continental countries.

Shaw Advertising Manager

The appointment of R. M. Wilmot Shaw as advertising manager of Olds Motor Works is announced by D. S. Eddins, general sales manager of the company. Mr. Shaw has been connected with the Oldsmobile organization for nearly four years as assistant advertising manager. Previous to that he was with newspapers, in both the business and editorial departments for five years.

Mr. Shaw succeeds E. J. Shassberger, former advertising manager, who recently was appointed territory analyzation manager.

Germane Resigns

The Timken Roller Bearing Co. has announced the resignation of Frank M. Germane, effective Jan. 1. It was not said what the position was to which Mr. Germane moves on.

Nugent Named President

W. J. Nugent, vice president and general manager of the Nugent Steel Castings Co., Chicago, was elected president to succeed Charles Piez at the meeting held in Chicago recently.

Prentiss Coonley was elected vice president and C. A. MacDonald, secretary.

Mr. Nugent has been associated with the company since 1918, when the present plant was erected. From 1918 to 1921 he served as vice president, and became general manager in 1921. The company was organized in 1915.

Watkins Sales Manager

H. A. Watkins has recently been appointed New York City district sales manager for the Bridgeport Brass Co. Mr. Watkins has had wide experience in general industrial and utility development work, and served in the war as a major of engineers. He occupied the position of Superintendent of Docks under the Mitchel administration.

Williamson Made Field Instructor

C. S. Chamberlain, director of sales development of the Oakland Motor Car Co., has announced the appointment of C. B. Williamson as field instructor. Mr. Williamson comes to his present position after experience as a retail salesman, service manager, dealer, distributor and factory district manager.

Car Insurance Plans Hamper Local Agents

NEW YORK, Dec. 1—That plans adopted by several automobile manufacturers for wholesale fire and theft insurance on cars at "a uniform and apparently lower rate than that of the automobile conference" deprives the local insurance agent of an opportunity to present to the buyer the necessity for casualty coverage, and that casualty companies should, therefore, be intensely interested in what the fire companies do as regards wholesale automobile insurance, is pointed out in the report of the special committee of three authorized by the National Association of Insurance Agents at Kansas City to investigate the subject of wholesale insurance.

Rates on Too High Level

"While rates may be scientifically arrived at," says the committee, whose report has just been published in the American Agency Bulletin, "they are on too high a level to attract additional car owners and they invite compulsory insurance measures because of this high level and the lack of general insurance coverage."

In view of the enactment of a compulsory liability insurance law in Massachusetts and the probability of such laws in other States, interests allied with the automobile industry are said to be contemplating forming insurance companies to issue liability insurance to part-payment purchasers.

"The demand by the automobile manufacturer to control the delivery price of the car on the part payment plan seems to be genuine, and the casualty companies can no longer afford to ignore it," says the committee.

Fiat Pushes New 7 Hp. Model Sales' Campaign

PARIS, Nov. 16 (*by mail*)—In the last fortnight, Fiat has conducted an important sales campaign in France in favor of the new 7 hp. model, which next year will constitute the big production job of this Italian concern. Prices on the French market are: Chassis with tires, 16,100 francs; phaeton, 21,900 francs; roadster, 19,750 francs; cabriolet or four-passenger sedan, 26,850 francs. These prices are rather higher than the most direct French competitor, the 6 hp. Renault, but sales are reported to have been very satisfactory.

G. M. and Vauxhall Deal Promises Well

LONDON, Nov. 18 (*by mail*)—Speaking at a luncheon given in his honor by the American Chamber of Commerce in London yesterday, J. D. Mooney, president of General Motors Export Corp., declared that the deal just concluded between General Motors and Vauxhall Motors, Ltd., would be to the mutual advantage of the two companies. He pointed out that there were several economic factors favorable to the manufacture of cars in England; for example, raw materials were readily available while transport and communication were comparatively easy for assembling materials, semi-manufactured articles and supplies.

"General Motors Corp.," said Mr. Mooney, "found in England the elements that provided a sound basis for investment in the motor industry, viz., high character values, the amount and character of labor needed, the fundamental production facilities, and an expanding market, both within England and throughout the British Empire."

Fisk Rubber Co. to Liquidate Dividends

Special Meeting to be Held on Dec. 11—$7,500,000 Available for Distribution

NEW YORK, Dec. 2—A special meeting of the stockholders of the Fisk Rubber Co., it is announced, will be held Dec. 11 to vote on a plan for the liquidation of accumulated dividends on the first preferred and second preferred stock.

Accumulated dividends on the first preferred amounted to $26 a share, and on the second preferred, to $31 a share. In settlement of the dividends on the first preferred stock, it is proposed to offer stockholders $1 in cash and $25 in first preferred convertible stock, which would be entitled to dividends of 7 per cent, ranking equally with the existing first preferred and convertible into four shares of common stock at any time up to Dec. 31, 1935. When all the dividends on the first preferred are paid, it is proposed to offer second preferred stockholders in payment of their accumulated dividends, common stock to be taken at a valuation of not less than $25 a share.

Ask Authority for $10,000,000 Loan

The company officials announced that "in view of the increase of crude rubber to $1 a pound, the working capital requirements will be greatly increased, and that, although the company is now in a very strong financial position, with current assets of $28,000,000, of which $8,200,000 is cash, nevertheless, it is desirable to procure additional working capital as insurance against contingencies which may arise. We ask stockholders, therefore, to approve the issue of not to exceed $10,000,000 short-term notes."

The company further reported that net earnings available for dividends for the year ended Oct. 31, 1925, would approximate $7,500,000.

Borland Co. Talks Over Incorporation

MINNEAPOLIS, Dec. 1—Incorporation of the Borland Automotive Works, manufacturer of Borland pistons, was discussed at a meeting held here last week. The session, held in the Ryan Hotel, was attended by about 300 people holding interest in the pending patent on the piston. A committee was appointed to arrange for temporary financing of the scheme.

D. V. Kemp, secretary-treasurer of the concern, declared that the financial condition of the firm was excellent.

Union Switch Co. Builds Die Room

SWISSVALE, PA., Nov. 30—The Union Switch & Signal Co. is spending $200,000 for building and equiping a new modern die room. Work has already been started, and it is expected to be ready Feb. 1, 1926. It will have approximately 10,000 sq. ft. of floor space and will be fireproof throughout.

The company is also installing a new 10,000-pound Erie steam hammer, which will place the company in a position to handle larger work than it has been equipped to do heretofore.

New Oakland Landau Sedan in Production

DETROIT, Dec. 2—A new style landau-sedan, featuring a longer body, new colors and larger windows is now in production at the Oakland Motor Car Co.'s plant.

The most noticeable change in the exterior appearance of the new sedan is the adoption of square finish rear windows in place of the former type. Rear corners of these windows have been rounded to conform to the rear roof lines of the body. The bows on either side mounted on the leather rear quarters have been retained. In addition to lengthening the body to provide more room in the tonneau, the rear seat has been widened.

A pyramid gray finish has been adopted for the lower body with the upper structure black. Red striping is employed along the belt line, on the hood louvres and on the artillery wheels. The price of the car remains unchanged at $1,295, including complete equipment in the form of snubbers all round, front bumper, rear fender guards, automatic windshield cleaner, dash gasoline gage, moto-meter and car heater.

Williams Heating Corp. Issue Oversubscribed

BLOOMINGTON, ILL., Dec. 1—One hundred thousand additional shares of the C. U. Williams Oil-O-Matic Heating Corp. were bought up this week within a few hours after their offering. Local officers were informed the stock was over-subscribed ten times.

It is expected that directors will soon put the stock on a $1.50 dividend basis, on early estimates that it will show an earning of $2.50 a share this year. The company, which now has a $1,000,000 working capital, has no bonds outstanding and no indebtedness. Expansion of the plant is planned and the Oil-O-Matic line will soon include a new small heater unit and a frigid-air machine to replace ice-boxes in residences.

Mack Truck Co. Builds

ST. PAUL, Dec. 2—The Mack International Motor Truck Corp. has bought an acre and a half of land here on which it will erect a $400,000 building next year for assembly, sales and service. This closes negotiations lasting several months with the industrial division of the St. Paul Association of Public and Business Affairs. The building will be one story, covering 80,000 sq. ft.

FINANCIAL NOTES

Lee Rubber & Tire Co.—The income account of this company shows net sales for the quarter ended Sept. 30, 1925, of $3,264,760, as compared with $3,499,297 in the corresponding period of 1924. Net sales for the nine months ended Sept. 30, 1925, were $9,324,164, as compared with $10,161,831 for the corresponding period in 1924. Net income for the third quarter this year was $79,279, as compared with a deficit for the same period last year of $22,022. Net income for the first nine months this year was $237,339, as compared with a deficit for the corresponding period last year of $186,588. Earnings for the first nine months this year were $1.11 per share on the 214,837 no par shares, against no earnings last year.

The Stromberg Carbureter Co.—This company declared the regular quarterly $1.50 dividend. The company earned in the third quarter net profit of $240,027 after expenses and Federal taxes against $99,359 in quarter ended September 30, 1924. Net for third quarter equals $3 share on 80,000 no par shares against $2.81 a share in preceding quarter and $1.32 a share on 75,000 no par shares in third quarter of 1924. Net profit for first nine months totaled $625,396 or $7.81 a share against $470,067 or $6.26 a share in same period of 1924.

G. A. Schacht Motor Truck Co.—W. E. Hutton & Co., stock brokers of Cincinnati and New York, have completed the purchase of $1,000,000 of 6 per cent three-year convertible gold notes of this company. These notes will be convertible during their life into 7 per cent preferred stock of the company. Proceeds of the sale of the issue will be used to add working capital to the Schacht Co.

The Detroit & Ironton Railroad.—This road, owned by Henry Ford, has asked the Interstate Commerce Commission for authority to issue and sell $2,265,000 of first mortgage 5 per cent bonds and $707,200 of capital stock. The proceeds are to be used to complete payment of construction work in connection with the line from Flat Rock to Springwells, Michigan.

The Ford Motor Co.—October sales of Ford cars totaled 140,936, as compared with 126,579 in the same month last year. Trucks showed 19,098 for October of this year, against, 17,640 last year; tractors, 5,003, against 5,357; and Lincoln cars, 670, as compared with 587 a year ago.

Motor Wheel Corp.—This corporation has declared 30 cents extra dividend in addition to regular quarterly of 50 cents on capital stock, both payable Dec. 20 to stock of record Dec. 10. The stock is now on a $2 annual basis.

Federal Motor Truck Co.—This company has declared regular quarterly dividend of 30 cents payable Jan. 2 to holders recorded Dec. 19.

Chrysler Corp.—The New York Curb has admitted to unlisted trading approximately 2,621,928 shares of this company's new no par common stock, "when issued."

Automobile Exports Increase 2,000 Units

Department of Commerce Figures Show Value in October was $31,156,269

WASHINGTON, Dec. 3—The combined United States and Canadian automobile exports increased more than 2,000 units in October over September, it is shown in revised figures just made public here by the automotive division of the Department of Commerce. This is in spite of the fact that there was a decrease in the number of passenger cars exported from the United States in October and only a slight increase in truck shipments.

$1,000,000 Ahead of September

The total October foreign shipments of automotive products from American plants were valued at $31,156,269, which varies only slightly from the figure attained in August and is almost $1,000,000 in excess of the September figure. The United States share in October automotive shipments amounted to $26,577,740 in value.

The increase in exports, it is pointed out, during the month, although not proportionately as large, is consistent with the gain in production, which was almost 20,000 over the preceding month. It is interesting to note that both United States and Canadian truck production declined, while truck exports of both countries showed slight increases. An unusual fact is that more trucks were exported from Canada in the month than were produced.

The percentage of exports to production was low in the case of United States passenger cars, but the percentage for trucks heightened, due to the falling off in truck production. United States and Canadian plants produced more passenger cars during October than in any previous month. The high passenger car production figure attained in April of this year was exceeded by more than 15,000 units. This gain is due largely to plants becoming oriented to the fabrication of new models, and the increase in demand for their cars at reduced prices.

The division states that the further decline in foreign shipments of light cars is not altogether attributable to a lessening in demand for this type of equipment abroad. It is compensated for by an increase in foreign assemblies, especially in two countries where assembling operations have recently been inaugurated. Cars valued at more than $2,000 were not exported to the same extent as they were in September, during which their shipments were maintained at an even level with those for August.

Graham Bros. to Make 3½-Ton Bus and Truck

NEW YORK, Dec. 2—A 3½-ton bus and a truck of the same capacity, powered with large size Dodge Bros. engines, will be brought out by Graham Bros. about Jan. 1, according to Robert C. Graham, director of the commercial car and truck division of Dodge Bros., and vice-president of Graham Bros., who returned from Europe last week.

Willys-Overland Issues New Common

Thus Liquidates Dividend Obligations on Preferred—Earnings $16,000,000

TOLEDO, O., Dec. 2—Liquidation of an obligation of $6,559,726 in accumulated dividends on the preferred stock of Willys-Overland Co. through issuance of common shares on a basis of $25 a share, was aproved by directors at their meeting this afternoon. The back dividends of 29¾ per cent have been piling up since October, 1920. In addition the regular quarterly cash dividend of $1.75 is made payable to the preferred stockholders on January 2 to those of record December 20. Certificates of rights which will be negotiable will be issued for the common stock distribution at the same time.

No Common Dividend

No action was taken on any dividend for the common shareholders. In taking care of the preferred obligation, 262,389 shares of common will be added those already outstanding, being distributed to 220,495 shares of preferred. Total common outstanding will be 2,527,034. Net earnings this year will be more than $16,000,000.

Voting power will now revert to the common shareholders.

New Carbureter Heater Out

MISSOURI VALLEY, IA., Dec. 3—The Patent Model Co., of this city, has begun the manufacture of an intake manifold carbureter heater which is designed to give quick starting in cold weather.

Developments of the Week in Leading Motor Stocks

NEW YORK, Dec. 3—The volume of trading on the New York Stock Exchange has declined steadily until a turnover of 1,500,000 shares daily is the rule. Price fluctuations in individual stocks likewise have narrowed, and, what is of more importance, the price trend has been toward higher levels. Excited speculation based upon rumor and conjecture has given place to a sober consideration of earnings and value. This is true especially of the stocks of companies identified with the automotive industry, which recently held the center of the speculative stage.

There is, and has been, a great deal of discussion of the credit situation. Most of this discussion has concerned itself with a prospective higher interest rate, and an advance in the re-discount rate of the local Federal Reserve bank. That such discussion is largely academic is shown by the flow of money to and from interior institutions in the last week. When call money declines to 4 per cent, interior banks withdrew their funds from the local market, but, as soon as the rate advanced above 5 per cent, surplus funds flowed again to this center. Those who have been fearful that a ½ of 1 per cent increase in the New York re-discount rate would result in a shortage of funds for speculation thus are compelled to a reconsideration of the fundamental fact that money flows to the point of highest return and that 5 per cent will attract money to the New York call market so long as that is above that obtainable at home.

Probably most interest attached to the advance in Chandler motors in the movements among the automobile stocks. The advance was due to reports of an impending consolidation of this company and Cleveland Motors, which is controlled by the same interests.

Whether or not the reported consolidation will also include the company which manufactures parts for both is not stated, the market responding to the rumor solely on the basis of its being favorable to holders of Chandler stock.

Elsewhere the trend of prices, while toward higher levels, was without new explanation. In General Motors, for instance, there has been substantial buying based on its known earning power and asset value. It is expected that this company will show about $16 per share for the year. Similarly, in Goodrich Tire & Rubber there has been the same character of buying, based on earnings which are expected to show between $17 and $20 per share for the common stock. Covering of contracts by previous sellers for the decline was responsible largely for sharp recoveries in Chrysler, Mack Trucks, Hudson Motor and, among the accessory stocks, Stewart-Warner Speedometer. This latter approximated the highest level at which it had sold this year.

The movement in these stocks was by no means uniform, and indicated the professional character of the trading. A feature was Willys-Overland preferred, which sold at a new high record on definite assurances that the accrued dividends would be paid under a plan which would result profitably to holders.—H. H. S.

Try $25,000,000 Cut in U. S. Highway Aid

Democrats and Republicans From East and South Fight Present Plan

WASHINGTON, Dec. 3—Led by Senator David I. Reed, of Pennsylvania, members of Congress—Democrats and Republicans alike—from Eastern and Southern States are preparing to effect a cut of $25,000,000 in the annual Federal appropriation of $75,000,000 to aid States in road building and other purposes under the "fifty-fifty" system. The contest will be sectional rather than political and it is expected, will have Administration sympathy in view of the position outlined last May by President Coolidge.

Last year Senator Reed made an effort to cut the $75,000,000 appropriation for good roads to half that sum, but failed because of the strength of Senators from the West, who were allied with some from the South. When the appropriation comes up this year, Senator Reed will propose an amendment to slice off at least one-third of it. Observers are of the opinion that the amendment will get a much larger support this year than last, while Senator Reed is hopeful that it may be adopted.

Western members are up in arms over the prospect of losing Federal aid, even in part. They contend that the automobile must be considered an inter-state commerce carrier, and hence road building, to an extent, must be on a National scale. They are mustering their forces to defend the "fifty-fifty" system.

Cleveland-Chandler Merger Unconfirmed

CLEVELAND, Dec. 2—Fred C. Chandler, president, Chandler Motor Car Co., and J. V. Whitbeck, president, Cleveland Automobile Co., declined tonight either to confirm or deny reports that were current in New York that the two companies would be formally merged.

The merger, if consummated, would cause little surprise, as it has been regarded as a logical move for some time. The Chandler company is the older of the two, and in February, 1919, Mr. Chandler and Samuel Regar, treasurer of the concern, together with Hornblower & Weeks, of New York, announced the organization of the Cleveland company. The control of the two companies is, therefore, identical, and, to a considerable extent, the stock is in the same hands.

Stockholders of record Feb. 27, 1919, of the Chandler Motor Car Co. were given the privilege of subscribing to stock of the Cleveland Automobile Co. on the following basis: every holder of 100 shares of Chandler stock might on or before March 5, 1919, purchase at $100 per share 20 shares of 8 per cent preferred of new Cleveland Automobile Co. and receive as bonus four shares of Cleveland Automobile Co. common stock.

FORD OPENS RIVER ROUGE STEEL MILL

DETROIT, Dec. 1—The new steel mill of the Ford Motor Co. at the River Rouge plant has been put in operation, this marking another step in the company's efforts to get control of its sources of supply.

The rolling mill, which has a capacity of 15,000 to 20,000 tons per month, is the first unit of the steel plant to be started. It is expected that the open hearth furnaces will start operation in March or April. In the meantime, billets are purchased from outside sources.

Marmon Co. Plans 75th Anniversary

INDIANAPOLIS, Dec. 2—The Nordyke & Marmon Co., builder of the Marmon automobile, has issued invitations for its seventy-fifth anniversary dealers' convention, which will be held at Indianapolis, Jan. 4, 5 and 6.

As a rather unusual feature of factory-dealer conventions, the Nordyke & Marmon Co. has issued invitations to the editors of the automotive trade press to be present at the gathering.

Arrangements have been made to run a special train from Indianapolis the evening of Jan. 6, after the close of the convention, to take dealers present to the New York automobile show, which opens two days later.

The Nordyke & Marmon Co. was organized 75 years ago as a manufacturing concern, and, with the coming of the automobile, turned its major attention to the building of a high-class type of motor vehicle. G. M. Wiliams is president and general manager of the company. Walter C. Marmon, chairman of the board, is the senior surviving member of the family still with the company, and Howard C. Marmon, another member of the family, is vice-president and chief engineer.

Rolls-Royce, Inc., Controls Brewster

NEW YORK, Dec. 1—Rolls-Royce of America, Inc., has acquired control of Brewster & Co., which has a plant on Long Island employing 400 men in the manufacture of custom automobile bodies. bodies.

Commenting on the acquisition, Henry J. Fuller, president of Rollys-Royce, said: "The Rolls-Royce Co. has acquired control of Brewster & Co., whose operations will be conducted on its premises as heretofore at Long Island City, and William Brewster will continue as president. Mr. Brewster will also become a vice-president of the Rolls-Royce company. It is probable the Rolls-Royce company will take over the Fifth Avenue show rooms of Brewster & Co. on 56th Street, New York, and the service station of Rolls-Royce in Long Island will be moved to the Brewster plant.

Willys-Overland to Reduce Body Types

1926 Output of 300,000 Cars Predicted at Boston Gathering

BOSTON, Dec. 1—At a meeting of more than 200 Willys-Overland dealers here at the Brunswick Hotel last week, H. G. Fitch, R. G. Payne and J. R. Farley addressed the meeting and the statement was made that the Willys-Overland Co. would produce 300,000 cars in 1926, or 80,000 more than in 1925.

Statistics show that business condition have improved throughout the country, particularly in New England, and it was said further that Mr. Willys expects his dealers in this territory to sell a minimum of 7 per cent of all cars sold next year to keep his output at 1,650 cars a day.

Sees Prosperous 1926

"Willys-Overland will not have as many body types as formerly," said Mr. Fitch, general manager of the New England territory. "Too many body designs are confusing to the buyers and they bother the dealers, because you can not stock and sell motor cars from shelves like shoes and neckties. With increased business, plus closed cars making good sales for all year instead of a few months, and a line of good cars, 1926 should be a fine year for all of us.

Mr. Payne, vice-president of the Commercial Investment Trust, Inc., said:

"The Willys-Overland finance plan, while our company is handling it, is in reality the Willys plan, for John N. Willys originated it, and worked upon it for a long time before it was finally put in shape.

"Under its provisions, it brings the financing of Overland and Willys-Knight sales down to such a point that no other company is below you. Also, instead of three months' notes, they are carried along for six months, so that you dealers go through into the Summer selling season before the notes are maturing."

Car Makers Second in Use of Babbitt Metal

WASHINGTON, Nov. 30—Excepting the railroad industry, the automobile manufacturers of the country are the largest users of babbitt metal, according to the U. S. Department of Commerce's statistics on that industry.

Figures compiled for the first ten months of this year show total sales of 40,835,617 pounds, of which approximately 8 per cent, or 3,268,000 pounds, was used by the automobile manufacturers.

Monarch Battery Co. Builds

KINGSTON, ONT., Dec. 1—The Monarch Battery Co.'s new factory is rapidly nearing completion here, and, when completed, it is expected, will turn out 800 batteries per week.

S. A. E. December Meetings Announced

Steel, Engines, Gasoline, Cylinder Lapping Included Among Topics

NEW YORK, Dec. 1—The Society of Automotive Engineers has just issued a list of its December sectional meetings, together with the subjects to be discussed.

The Pennsylvania Section will meet at Reading on Dec. 8, and will make an inspection trip through the plant of the Carpenter Steel Co., and listen to a paper on "Automobile Steels," by Dr. B. H. DeLong. The Indiana Section will gather at the Hotel Severin, Indianapolis, on Dec. 10, and hear a talk on "High-Duty Engines," by F. S. Duesenberg. The City Club at Los Angeles will be the scene of the Southern California meeting on Dec. 11, and, following a dinner, addresses will be delivered by R. E. Haylett and J. B. Terry on "Manufacture and Utilization of Gasoline." The Washington Section will meet at the Cosmos Club, also on Dec. 11. On this occasion, a paper on "Steam Cooling" will be read by A. G. Herreshoff.

Discuss Gas-Electric Drive

"Gas-Electric Drive" is the topic to be taken up at the Cleveland meeting on Dec. 14, and the speakers will be J. C. Thirlwall and E. M. Fraser. The Buffalo Section, on Dec. 15, will listen to Ernest Murphy, who will have as his subject "Transportation Service." At the Engineers Club, Dayton, O., O. T. Kreusser will speak Dec. 16 on "Organization and Operation of General Motors Proving Ground." Dec. 17 the Detroit Section will gather in the General Motors Bldg. to hear a discussion of "Cylinder Lapping" by factory representatives of Ford, Dodge, Packard, Hupp, Paige, Chrysler and White companies. The Chicago meeting will take place Dec. 18 at the Engineers Club to hear F. S. Duesenberg speak on "High Efficiency Engines." The final meeting of the month will be that of the Northern California Section on Dec. 29 at the Engineers Club, San Francisco, when Harold Jarvis is to address the meeting on "Problems of Fleet Operation."

Canadian Merger Completed

ST. CATHERINES, ONT., Dec. 2—General Manager B. W. Burtell, of McKinnon Industries, Ltd., announces that company has secured the plant and business of the J. H. Williams Co., in this city. The latter has 80 employes and manufactures small tools.

Both plants will be continued in operation under the McKinnon management, and extensions are planned at the newly acquired factory.

In April, 1920, the interests of Whitman & Barnes Mfg. Co., of Chicago and St. Catherines, were merged with those of J. H. Williams & Co. The plan provides for the operation by J. H. Williams & Co. of drop forgings and drop forged tool plants at Brooklyn, N. Y.; Buffalo, West Pullman, Chicago and St. Catherines, Ont. The business has been under the name of Whitman & Barnes Mfg. Co. from 1880 to 1920, and for ten years prior to that date it had been known as Tollinson Burch Co.

Machine Tests Oils' Lubricating Value

MILWAUKEE, Dec. 1—A machine for testing the actual lubricating value of motor oils under conditions similar to those prevailing in the use of gasoline motors has been designed by Thomas Rodgers, city paving chemist; Paul Johanning, mechanical engineer, department of public works, and Joseph W. Nicholson, chief buyer for the central board of purchases here.

This machine is said to be more complete than any other similar device, and duplicates the actual operating conditions existing for automobile engines. A 3-in. bearing is run by an electric motor in the oil to be tested. Pressure on this bearing can be varied from 20 to 2,000 pounds. The current used by the motor and the temperature of the oil as it rises with the friction of the bearing are both measured.

The object in designing the machine was to enable the city to compare lubricating oils on the market and make purchases on a competitive basis as to real value.

Mexican Purchases of Cars Increase

LAREDO, TEX., Nov. 16—In the first 10 months of 1925, a total of 1,072 cars of automobiles were exported to Mexico from the United States through Laredo, as compared with a total of 737 cars for the entire year of 1924.

The shipments for the first 10 months represent only about one-half of the total exports, as many were made by water through the port of Tampico, and others entered Mexico by way of Eagle Pass, Brownsville, El Paso and other border gateways. The exports through Laredo for October were 177 cars, and the total for November is expected to reach more than 200 cars. The increased demand for automobiles in Mexico is due largely to the general revival of business and a restoration of peaceful conditions. The construction of modern highways which is now in progress also is having the effect of increasing automobile sales, it is stated.

Chicago Fuse Co. Moves

CHICAGO, Nov. 10—The Chicago Fuse Mfg. Co., manufacturer of Union and Gem fuses and Union outlet and Gem switch boxes, has moved its Detroit office from the Transportation Bldg., to 429 Wayne St.

Urged to Continue Federal Road Aid

Transcontinental Highways' Plan Given Impetus at Detroit Dinner

DETROIT, Dec. 1—The campaign for continuance of Federal aid for transcontinental highways was given impetus at a dinner held in Detroit for the American Association of State Highway Officials by the National Automobile Chamber of Commerce and the American Automobile Association. The attendance at the dinner numbered State highway officials from every State in the Union, men interested in the good roads movement and prominent executives of the various automobile manufacturing companies.

The demand came from four distinct sources, which represent practically all phases of American business and economic life. The first came from the United States Post Office Department, represented by H. H. Billany, fourth assistant postmaster general; next came the American Automobile Association, representing the individual motorists and itself represented by President Thomas P. Henry; third was the National Automobile Chamber of Commerce, representing the manufacturer, whose position was stated by George M. Graham, vice-president of the Chandler Motor Car Co. The fourth demand came from State highway officials. Although they were not represented by one of their number on the program, their acceptance of the points as advanced by the speakers proved that they were unanimously for Federal aid.

"Complete the National System"

It was pointed out by Roy D. Chapin, vice-president of the N. A. C. C., and toastmaster for the evening, that while, "we are in harmony with President Coolidge that all funds must be used on inter-state roads, let's not cut appropriations and delay completion of our present National system." This one statement was one of the two keynote points of the evening. The other was the demand for Government help in building and in aiding the building of good roads and came from George M. Graham, speaking for the N. A. C. C. Mr. Graham said:

"The highway program as now laid out is so strong that none dares get or stand in its way. The people of the United States realize more than ever what highways mean to them and the demand is now too strong for any one man or group of men to deny."

Economic need of the public, Mr. Graham said, must determine the route of the highways, and nature and the volume of traffic must determine the questions of width, sub-grades and surfacing. The costs, it was pointed out, should be levied against all the people by general taxation and the major part of the cost of maintenance properly should be charged against vehicles using the highways.

Industry Watches Stocks and Used Car Market

(Continued from page 954)

what the cars cost them. The factories are trying to help; naturally, at this period, their efforts are concentrated on keeping new cars moving and preparing for the new season.

Interest in the two National shows to be held in New York and Chicago, when various new cars and models will be introduced, is pronounced at the factories. Output, sales and the shows are jointly holding the center of the stage. It is like the zero hour in battle, with the manufacturers mustering their forces for the opening dates, when the struggle for another successful year will begin.

Parts and accessory business is unusually satisfactory for this time of year. The Christmas drives of the jobbers are producing results. Truck production and sales are in general following the tendencies of passenger cars.

Sectional reports follow:

New England

A general slackening tendency was noted in this territory during November. Not only Boston but also the outside districts were affected. Used car sales were not as active as some of the dealers had anticipated. One firm specializing in used cars states that it is doing very well but the concern believes in quick turnovers at small profit. In the accessory trade, a drive is being made to get the Christmas selling under way. General business is showing signs of picking up, according to reports from mercantile companies.

Middle Atlantic

Conditions generally in this territory are satisfactory, with sales running well above the level of a year ago. From nearly all the principal centers, however, comes the word that used car stocks are moving slowly and tending to increase. Extraordinary efforts are being made by distributors and dealers to correct this condition. The situation in Philadelphia, which is more or less typical, is expressed as follows:

"The used car situation is decidedly unsatisfactory, and, in some cases, supreme efforts are being made to effect sales. While not many weeks ago the market appeared to be well cleared of the surplus, there has been a lapse into the former undesirable position. Repossessions are frequent and a large number of these cars are returned in decidedly poor condition. The time allowance is being generally extended, many permitting 18 months for full settlement, with only a small amount down as first payment."

An exception to the rule appears to be Syracuse, where used cars are still, apparently, moving well. Throughout the Middle Atlantic section, parts and accessories are selling at an unusually high level.

South Atlantic

Conflicting reports come from this territory with sales ranging from extraordinary to only fair. North Carolina and Virginia are enjoying particular prosperity, with a demand of proportions seldom equaled at this season of the year. All lines of industry and trade are prosperous in these States, while South Carolina conditions, recently somewhat unsatisfactory, are showing improvement, especially in the Piedmont section, where the demand for motor trucks is decidedly better than it was a month ago.

Business in the Maryland and Georgia territories is on a somewhat lower plane, with used car stocks offering some difficulties. On the other hand, in Florida, the real estate boom is resulting in what is described as phenominal sales, by far the biggest business dealers here have ever enjoyed. The embargo has been virtually overcome by unloading cars at Valdosta, Ga., Jacksonville, Fla., and Sanford, Fla., then driving them to the dealers within the State under their own power. In many cases, Florida dealers state that car buyers are offering exceptionally liberal premiums for quick deliveries.

Southern

Retrenchment is the order of the day in these States. Louisville reports a slowing up of sales, but adds that used car stocks are showing a slight decrease. From Birmingham, Ala., comes the word that a seasonal lull has been rather less than usual. Used car prices have been tending downward, with special efforts being made to move stocks. Conditions are good in Louisiana and Mississippi, excellent rice and truck crops having yielded well and brought fair prices.

The slump in cotton prices affected automotive sales in Texas. Used car stocks are heavy and dealers are slashing prices to move them.

Central

Chicago reports an actual gain in November sales over October, but adds that stocks are increasing to some extent. Collections are good and repossessions few. A tendency towards more lenient financing terms has developed, but has been frowned upon by all recognized authorities and has not become general as yet. Repossessions are few. A different picture is presented in Iowa, as the slump in corn has seriously affected business.

Generally throughout Ohio sales are on a lower level than a month ago, and there are complaints of large used car stocks which are slow in moving.

November business in Milwaukee is expected to be close to the October level but in the Wisconsin rural districts there has been a marked decline, which, however, is customary in that State during November. Used car stocks have increased, with open cars a drug on the market.

In Missouri, sales of new passenger cars remain good for this season of the year. Used car stocks are not high as yet, although a few dealers have expressed the opinion that they have too many open cars on their hands.

Middle West

An optimistic report comes from Kansas City, where sales were better in several important lines during November than October, this being accounted for by better weather conditions during the month just passed. In Indiana, sales are on an excellent scale considering the time of year, but used cars are not moving as well as could be hoped. In recent weeks, there has been a large number of repossessions in some lines of low priced vehicles, with a consequent reaction on new car buying, while other lines are making much better records than ever before.

West

Spotty conditions are noted in the Far West. Despite the prosperous business of the mountain States, registrations for November in Utah totaled only 746 passenger cars, compared with 1,075 in October. It is being found difficult to move used cars except at price concessions. The market is being affected not only by the low price of new cars but by the tendency toward easier financing terms. In Colorado there has been considerable improvement, while along the Pacific Coast sales range from fair to good. A bumper crop has helped California particularly, with sales of trucks showing a striking increase over the same period last year. Extreme competition in financing terms is a disturbing factor but the used car situation does not appear to be very bad except in Southern California.

California and Florida for Rubber

WASHINGTON, Dec. 3—Florida and California loom as possible fields for profitable rubber production, it is set forth in the annual report of the Secretary of Agriculture, which deals at length with "rubber possibilities in the United States."

Coming Events

SHOWS

Dec. 5-16 — Brussels, Annual Automotive Show, Palais du Cinquantenaire.

Dec. 7-20 — Buenos Aires, 8th Annual Argentine Automobile Show.

Jan. 9-16—New York, N.A.C.C. National Annual Show, Grand Central Palace.

Jan. 18-23—New York, Twelfth National Motorcycle, Bicycle and Accessory Show, New Madison Square Garden.

Jan. 22-30—National Motor Boat Show, Grand Central Palace, New York.

Jan. 30-Feb. 6 — Chicago N.A.C.C. National Annual Show, Coliseum.

Jan. 30-Feb. 6—Chicago, Automobile Salon, Hotel Drake.

Feb. 13-Mar. 15 — International Automobile Show, Copenhagen, Denmark.

NATIONAL SHOW WEEK EVENTS

Jan. 11—Atlantic District, National Automotive Dealers Association, East Ballroom, Hotel Commodore, 10 A. M.-5 P. M.

Jan. 11—Rubber Association of America, Inc. Banquet and Meeting, Hotel Commodore.

Jan. 11 — N. A. C. C. Headquarters, Motor Truck Manufacturers Meeting.

Jan. 12 — National Automobile Chamber of Commerce Dinner, Hotel Commodore, 6.30 P. M.

Jan. 13—M. & A. M. A. Annual Dinner, Hotel Astor, 6.30 P. M.

Jan. 13 — Franklin Dealers Luncheon, Hotel Commodore, 1 P. M.

CONVENTIONS

Jan. 11—Rubber Association of America, Inc., Meeting, Hotel Commodore.

Jan. 11-13—New York, Second World Motor Transport Congress, Roosevelt Hotel.

Jan. 21-22—Hotel Statler, Buffalo, N. Y., Winter Sectional Meeting, American Society for Steel Treating.

Feb. 2-3—Congress Hotel, Chicago, Automotive Electric Service Association.

S.A.E. MEETINGS

National

Jan. 14 — New York, Annual Dinner, Hotel Astor.

Jan. 26-29 — Detroit, Annual Meeting.

Sectional

Dec. 8—Pennsylvania. Reading, Pa. Leave Phila. 1 P. M.

Dec. 10—Indiana. Hotel Severin, Indianapolis. Supper 6.30 P. M.

Dec. 11 — Southern California. City Club, Los Angeles. Dinner 6.30 P. M.

Dec. 11—Washington. Cosmos Club, Washington D. C. 8.15 P. M.

Dec. 14—Cleveland. Hotel Hollenden. Dinner 6.30 P. M.

Dec. 15—Buffalo. Hotel Statler. 8 P. M.

Dec. 16 — Dayton. Engineers Club. Evening.

Dec. 17—Detroit. General Motors Bldg. Evening.

Dec. 18 — Chicago Engineers Club. Dinner 6.30 P. M.

Dec. 29 — Northern California. Engineers Club, San Francisco. Dinner 6.30 P. M.

Coming Feature Issues of Chilton Class Journal Publications

January 1—Automobile Trade Journal —National Shows Number.

January 7—Motor Age — National Shows Number.

January 14—Motor World Wholesale— New York Show Report.

February 4—Motor Age — Chicago Show Number.

February 4—Motor World Wholesale —Chicago Show Report.

February 18—Automotive Industries— Statistical Issue.

Lazarus Made Head of U. P. C. Bureau

NEW YORK, Nov. 30—Announcement is made of the appointment of Arthur Lazarus, some time chief of the cost accounting bureau of the Chamber of Commerce of the U. S., as managing director of the bureau of business economics of the United Publishers Corp., with main office here, and branch offices in Boston, Philadelphia, Washington, Cleveland, Chicago, St. Louis, and San Francisco.

The bureau will offer an accounting, engineering and research service in the department store, textile, boot and shoe, automotive, iron and steel, and hardware fields, among others.

C. G. Phillips, president, in commenting on the formation of the bureau, said:

"The various magazines and trade papers owned by the United Publishers Corp., which include Dry Goods Economist, Iron Age, Hardware Age, Boot and Shoe Recorder, and *Automotive Industries*, have for many years been called upon for consulting services of diversified and important character. We have been increasingly asked to carry into effect suggestions made in this way, and in order to permit us to do so, the new bureau of business economics has been organized."

N. C. Bus Co. Asks Charter

RALEIGH, N. C., Dec 1—Applications for a charter of incorporation for the Carolina Coach Co., a $2,000,000 enterprise, to operate bus lines between Raleigh and Greensboro, Rocky Mount, Wilson and Fayetteville, N. C., has been filed in the office of the Secretary of State in Raleigh.

The new company is the result of the purchase and consolidation of bus lines out of Raleigh by Hambleton & Co., investment bankers of Baltimore, Md.

Victor Rubber Products Adds to Rubber Mat Line

SPRINGFIELD, OHIO, Dec. 1 — Preparations are being made by the Victor Rubber Products Co., successor to the Victor Rubber Co., to add to its line of rubber mats. While the plant is going ahead as usual, with the exception of the manufacture of Victor rubber tires, the receivership has not been ended by the court. Final entry will probably be made soon.

The Victor Rubber Products Co., which was organized with a capital stock of $150,000 by local men, has elected the following officers: president, J. B. Cartmell; vice-president and general manager, H. H. Durr; secretary, George Cugley; treasurer, Arthur R. Hill; assistant secretary-treasurer, R. F. White.

New Racing Cars Have 91 Cu. In. Engines

LOS ANGELES, Dec. 1 — R. C. Durant has started construction of the first of a fleet of racing cars, which he plans to enter in the next Indianapolis race, and has engaged the services of Harlan Fengler, a racing pilot.

Two of the cars are expected to be ready for speed trials on the Culver City track early in 1926 and the entire fleet in time for the Indianapolis race. It is expected that the 91 cu. in. engines will make up to 8,000 r.p.m.

B.P.I.C. Sends Its Men Overseas

NEW YORK, Nov. 30—Three representatives of the Business Publishers International Corp. have sailed in the last few weeks to represent that organization in foreign lands. They are J. F. Downey, who will be stationed in Buenos Aires; A. R. Gota, Mexico City; and Paul Malenchini, Havana. They will concern themselves with the editorial and subscription activities of the company. Among the B. P. I. C. publications are Ingenieria Internacional, El Automovil Americano and The American Automobile (Overseas Edition).

Mr. Downey was previously the subscription representative of El Automovil Americano in Argentina, Uruguay and adjacent territory. Mr. Gota, for the last three years, has been assistant editor of Ingeniera Internacional. Mr. Malenchini was formerly export manager of Pratt & Lambert Co.

Cleveland Association Lists Inefficiency Causes

CLEVELAND, Dec. 2—Poor lighting, cramped space, poor ventilation and other unsatisfactory conditions are serious causes of delay in manufacturing. This message was given to members of the Cleveland American Plan Association, at yesterday's meeting, by V. R. Nelson, of the Van Dorn & Dutton Co., Cleveland manufacturer of automobile gears, at a meeting of the production standards group of the association.

G. F. McIntosh, of the Columbia Axle Co., and J. T. Nichols, of the Chandler Motor Car Co., were among other speakers.

AUTOMOTIVE INDUSTRIES

VOLUME 53 — *Philadelphia, Thursday, December 10, 1925* — NUMBER 24

$115,000,000 Profit *in* 14 Years

The Financial Story of the Studebaker Corporation

Recent rise in securities is accounted for by strong fundamental conditions. Over 50% of earnings retained in business.

By A. Motelle

THIS is the first of a series of articles dealing with the financial histories of representative companies in the automotive field. Among companies to be similarly analyzed in subsequent issues will be

General Motors Corp.
Mack Trucks, Inc.
Hupp Motor Car Corp.

The articles are based on careful studies of fact by a competent economist and show clearly why motor stocks generally are up among the leaders in investment value today.

You will want to follow this series through. Watch for announcement of the second article in an early issue.

IN the recent upswing of motor stocks, the securities of the Studebaker Corporation have been well up among the leaders. The vigorous rise in the stock, as will be shown in this survey, can be fully accounted for by the strong fundamental conditions of the company. It has been for years a builder of assets as well as of cars.

The policy of the company of building up equities was inherited from the predecessor company which for some sixty years manufactured horse-driven vehicles before it entered the motor field.

The writer has made a careful study and analysis of the published reports of the present company and its predecessor and the conclusions expressed here as well as the statements of fact are based on those reports.

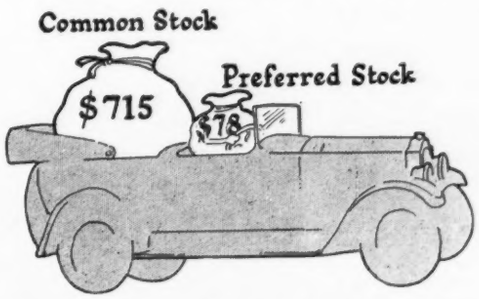
From 1868 to 1911, out of total earnings of $16,000,000, the Studebaker Brothers Manufacturing Company—the name under which the earlier manufacturing operations were conducted—put back into the business $10,000,000 and distributed in dividends $6,000,000. During the 14 years' existance of the motor company, net profits have been $115,000,000, after all deductions, and of this $49,500,000 was paid out in dividends, $60,200,000 was retained in business and the balance was appropriated for extraordinary write-offs and surplus adjustments.

In other words, 43 per cent of the total net profits realized in the period 1911-1924 was disbursed in dividends (33.8 per cent to common stockholders and 9.2 per cent to preferred stockholders) and 52.4 per cent was retained in the business. The remaining 4.6 per cent went to extraordinary charge-offs and adjustments.

As a result of this asset-building policy we find that net tangible assets, which in the first year of the present motor company's existence represented only 54.5 per cent of the book capitalization, increased to 107.9 per cent in 1918, then declined in the critical year of 1920 to 90 per cent, increased to 97.8 per cent in 1921, and then, due to a 25 per cent stock dividend, declined to 93.9 per cent, but at the end of 1924 stood at the highest ratio in the company's history, 112.5 per cent. This would indicate that there is now no water whatever in the capitalization.

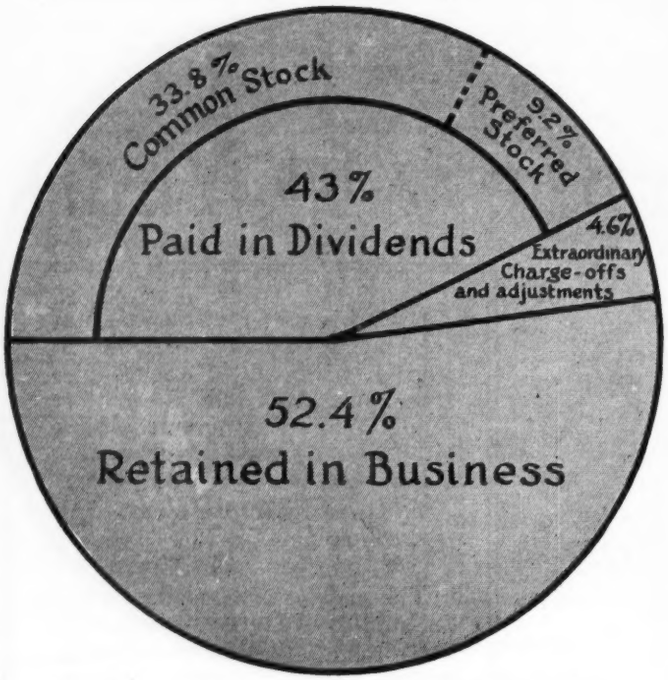
That the tangible assets as carried on the books are conservatively valued can be presumed from the liberal betterment expenditures and depreciation charges. Last year, for instance,

Each Car Sold Supports—



This illustration shows the amount of common and preferred stock supported by each car sold by the Studebaker Corp., based on 1924 figures

How Studebaker Has Distributed Net Profits



Studebaker made net profits of $115,000,000 in the 14 years of 1911-1924, inclusive. How they were divided is shown in the accompanying circle

FTER many years of undervaluation by the investment world, automobile stocks in the last few months have been subjected to a searching reappraisal which has left the market with a better appreciation of their true value.

This realization of the heretofore neglected investment opportunities offered by motor stocks came not only with considerable suddenness but also at a peculiar time, or during the last half of the year when production and sales of motor vehicles were normally declining. Furthermore, the seasonal slackening of demand this year was accompanied by quite drastic price-cutting, which ordinarily would be regarded as forecasting a possible reduction in stock earnings and thus affecting adversely the value of the stock from the investor's point of view.

The reasons why the investment community all of a sudden assumed a different attitude toward these stocks, long considered as speculative, and valued on the same basis as other speculative securities, are numerous. The active bidding for Dodge Bros. by two prominent banking houses last spring might have been one good reason. Another, and a very important fundamental one, has been the continued growth of the

the company spent in gross expenditure as much as $86 per car sold, of which $17.65 was charged to plant and property sold or demolished, and $12.70 to depreciation.

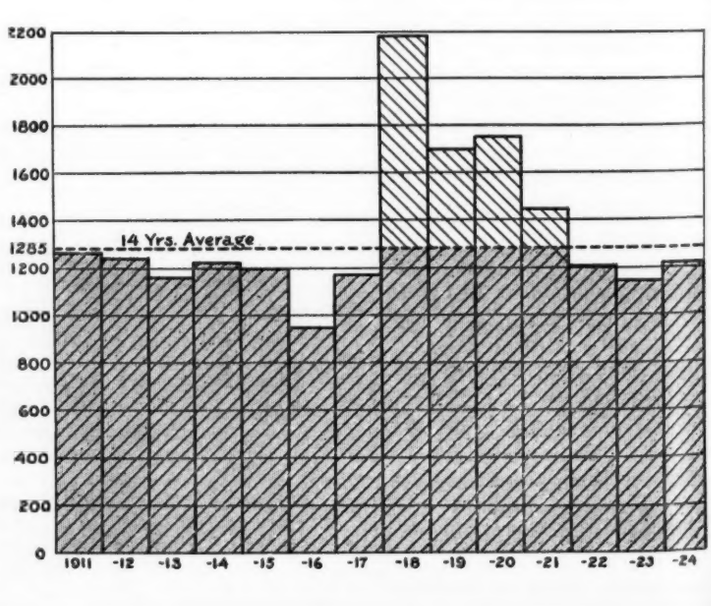
During the 14 years' existence of the company it has spent $60,300,000 on additions and betterments, or $1,400,000 in excess of the amount at which the plant was carried at the end of 1924. The amounts spent on betterments and additions averaged 18 per cent per annum of the value of the plant, and of this amount over $11,500,000 was charged to depreciation and property sold and demolished.

The latter was at the average annual rate of 3.45 per cent of the value of the plant; and depreciation proper for the 14 years averaged 2.45 per cent per year. Repairs and renewals charged off to operating expenses averaged 11.3 per cent of the value of the plant. With liberal depreciation charges and with an amount spent on additions and improvements in excess of the present value of the plant, there can be little doubt that the plants are conservatively valued. The average annual growth in the value of the plant was 11.6 per cent on a compound average basis; from January, 1911, to December, 1924, it increased from $9,812,000 to $52,473,000.

But Studebaker did not increase its productive facilities for idle purposes. The expansion of plant was merely an instrument with which the growth of its production and sales power was made possible. During the period of the

Net Value of Sales Per Car Sold—1911 to 1924

1911—	$1263.03
1912—	1242.51
1913—	1170.99
1914—	1225.16
1915—	1206.93
1916—	940.86
1917—	1183.92
1918—	2182.70
1919—	1686.73
1920—	1761.12
1921—	1450.87
1922—	1207.76
1923—	1144.56
1924—	1228.28



industry year after year with the much-discussed "saturation point"—predicted ever and anon by some students—apparently as far removed as ever.

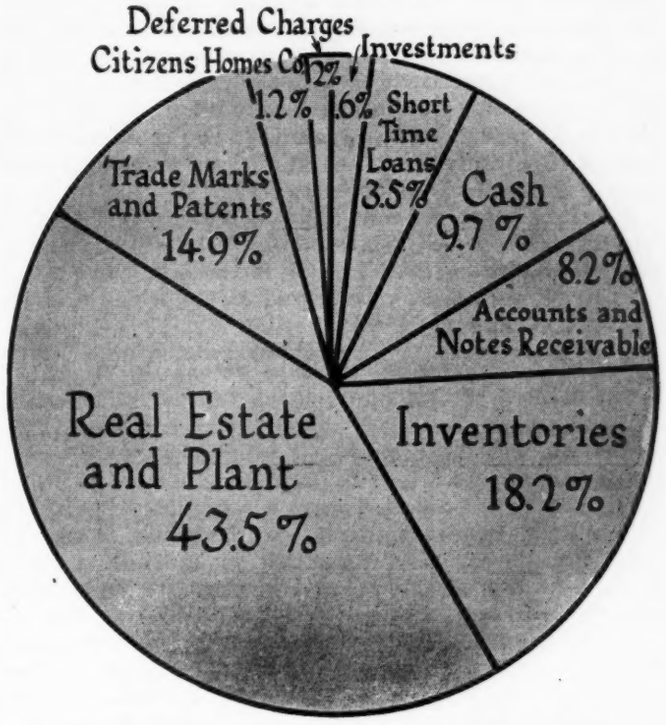
Also, with a constant growth in the number of cars in use, the replacement demand has grown proportionately, until it is now estimated as around 2,500,000 vehicles, including trucks and buses, per year. This assures the industry an immense market on that account alone and makes for a large degree of stability.

These various factors have left their impression on the investor. They have led him to revise his earlier ideas as to the stability of the industry and the speculativeness of its securities. He has come to realize that a dollar earned by an automobile producing organization is as good and as safe as a dollar made in any other branch of industry.

It is intended, in the course of several articles which have been prepared especially for *Automotive Industries*, to show the justification that exists for giving automobile stocks a better investment rating than they have been accorded in the past. This will be done by analyzing in detail the various aspects of the financial economy of important producing companies, as has been done in this instance with Studebaker.

company's life the value of the plant has averaged 32.6 per cent of the value of sales, although in some exceptionally good years the value of the plant was as low as 21.7 per cent of sales, while last year, a rather subnormal year for Studebaker, the ratio of plant to sales was at the record high level of 43.3 per cent. In the current year, however, Studebaker is again showing an ability to utilize its plant facilities to a more normal extent.

Distribution of Studebaker Gross Assets



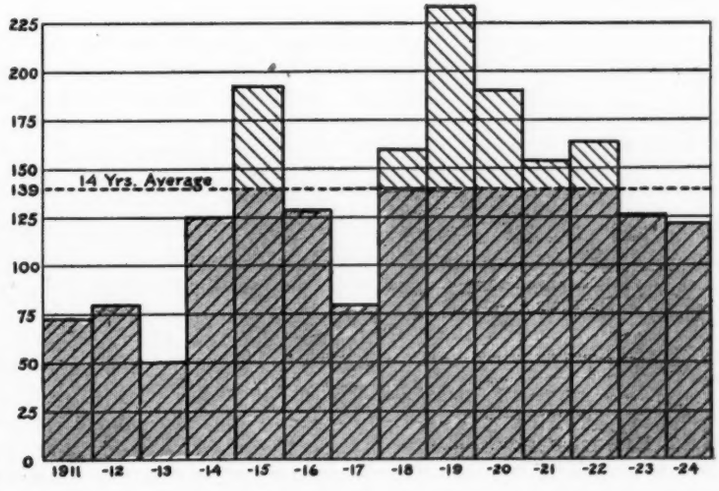
This circle is based on the distribution of Studebaker gross assets as of June, 1925. The Citizens' Homes Co., which is carried at 1.2 per cent, is a subsidiary

But production or sales power is not an aim in itself; the final goal is profits. On the average, the net profit on the value of the plant has been 27.1 per cent per annum. In the earlier years, when the business was in its infancy, the profit on plant was around 16 per cent; in the exceptionally profitable years of 1915 and 1916 profits on the plant were 73 per cent and 64 per cent respectively, in 1922 they were 42 per cent and in 1923, 35 per cent. But in 1924 they fell to 23.5 per cent or almost to as low a level as during 1917 and 1918, which were exceptionally poor years for Studebaker because of the fact that the company had to greatly curtail its automobile business, having placed its facilities at the disposal of the Government for war work. The war business yielded only 5.8 per cent on sales against 13.9 per cent and 16 per cent earned on sales of automobiles in 1916 and 1915 respectively.

The margin of profit on sales has averaged 10.9 per cent for the 14 full years of the company's existence. 1915 was the best year in this respect with the margin of profit on sales of 16 per cent. Since 1914 this margin has never fallen below 10.2 per cent and in the last 5 years it has averaged 11.3 per cent. In 1922 it

Net Profit Per Car After All Deductions—1911 to 1924

1911—	$ 73.31
1912—	81.10
1913—	50.05
1914—	125.26
1915—	193.56
1916—	130.70
1917—	82.64
1918—	162.76
1919—	236.65
1920—	190.81
1921—	156.20
1922—	164.01
1923—	126.35
1924—	124.93



was as high as 13.6 per cent. In this respect it is interesting to note that there is a surprisingly good control of operating expenses by the Studebaker management. While the margin of profit on sales naturally tends to increase with the increase in the volume of cars sold, the relationship between volume of production and the margin of profit is not so close as in other companies. For instance, the number of cars sold dropped from 145,167 in 1923 to 110,240 in 1924, or some 24 per cent, while the margin of profit dropped from 11 per cent to 10.2 per cent, or only .8 per cent.

Only ten years ago the company's sales amounted to less than 50,000 cars, while in 1923—the record year to date—they rose to 145,167 cars. In the first 9 months of the present year the company sold 98,416, against 65,669 cars in the same period last year.

Average Value of Sales

The average net value of sales per car sold during the life of the motor company is $1,285; last year it was $1,228. Before the war the average net value of a car sold was higher than at present. It was $1,263 in 1911 and $1,215 in 1914. During the inflation years it was $1,686 and $1,761 for 1919 and 1920 respectively. In the armistice year of 1918, when the company was heavily engaged in the manufacture of war goods and reduced the output of automobiles to an insignificant proportion, the net value per car received by the company rose to the record figure of $2,183. Generally speaking, the value per car received by the company decreased with the increase in the annual volume of sales, this being partly due to the fact that the increase in the number of cars sold, which usually comes with the spread of prosperity, is mostly in the cheaper models, and partly to the fact that the increased production makes it possible for the company to shade prices, as instanced by the recent cut ranging from $50 up to $405 per car.

The ability to produce and sell a vastly superior car than some 14 years ago at a price substantially lower than in earlier years, this in spite of higher costs of raw materials, is the result of the tremendous progress of the industry in all its various aspects of engineering, operating efficiency and merchandising methods. Moreover, the lower prices per car did not impair the margin of profit to any important extent.

During the whole period of the company's existence the average profit per car has averaged $139, and the margin of profit per dollar of net sales averaged 10.87 cents. Last year, a poor year for Studebaker, the profit per car amounted to $125; in 1923 it was $126.4. The margin of net profit was 10.2 cents and 11 cents respectively and in the first 6 months of 1925 the company earned net 11.7 cents on every dollar of net sales. However, in the second half of the year the margin of profit may be somewhat reduced due to the reduction in prices.

Financial Structure Simple

The financial structure of the company is very simple. It consists at present of 1,875,000 shares common and 84,000 shares preferred. The common shares, although without par value, are carried on the books at $40 and represent a recapitalization of 5 present shares for two 1923 shares of $100 par value. Roughly and on the average the business was built up under a capitalization where preferred stocks were 20 per cent and common stocks 80 per cent with no funded debt. The ratio of preferred to common is now as 1 to 9.

On the average, during the 14 years period, the book capitalization has been 111 per cent of the net tangible assets, but, as we have already observed, the policy of building assets had resulted in accumulation of assets in excess of book values and by 1924 the book value of the capitalization was only 89 per cent of tangible assets. This means that for every dollar of book capitalization there were $1.125 of net tangible values. In the latter the equity of one share common amounted to $45.55 and by the present time has already surpassed $50.

These net tangible assets on the average, during the life of the company, have been about equally divided between net working capital and plant and property, the latter about 5 per cent more than the former. Up to 1920 working capital was considerably in excess of the value of the plant. Afterwards, with the change in the policies of the company, a rapid expansion of plant took place: at the end of 1924 on every one dollar of working capital there was $1.76 of plant—the highest ratio on record, which reveals perhaps a somewhat too rapid expansion of plant. In June, 1925, the ratio fell to $1.35.

During the life of the company the working capital consisted on the average of $3 of current assets and $1 of current liabilities. In the early years of growth of the business the ratio was nearer 2 to 1, and in 1924 it was at 3.15 to 1. Inventories averaged 53 per cent of current assets; 85 per cent of net working capital and 156 per cent of current liabilities. On the average, one dollar of sales was turned over by the company with 29.7 of net working capital and 25.3 per cent of inventories.

The tendency, as one might have expected, has been for working capital and inventories to be turned over faster with the expansion of plant facilities, but the turnover of plant which in the earlier history was over 3 times a year, and in 1915 almost 5 times, fell to less than 3 times in the more recent years. Last year it was less than 2½ times, or below the average for the whole period, which was 3.07 times.

The turnover of net tangible assets—plant and net working capital—averaged for the whole period a little over 1.5 times that of book capitalization, without counting the surplus, a little over 1.35 times.

Net Profits on Tangible Assets

The net profits on the net tangible assets averaged 16.9 per cent and on the book capitalization 14.9 per cent.

The total amount of dividends disbursed aggregated 43 per cent of total net profits. The preferred stockholders received $1 for every $3.67 received by the common, and the latter in addition to every dollar of dividend had $1.55 of undistributed earning reinvested in the property or retained in the treasury.

Finally it may be of interest to note that the dividends amounted to 4.8 per cent of the total net value of sales and 7 per cent of the average net tangible assets.

Looking at the company's finances from the point of view of physical volume we find that on the basis of 1924 returns the capitalization supporting one car sold consisted of $715 of common stock and $78 of preferred stock, and on the asset side of the balance sheet we find that back of one car sold there were last year $835 of tangible assets. The latter were turned over 1.43 times.

Of the above tangible assets per car sold, $505 was the average value of plant per car and $330 the net working capital per car. For every $1 of automobile value sold by the company there was last year 44 cents of plant, 37 cents of quick assets (in which 22 cents were inventories), and 12 cents of current liabilities, leaving a net working capital of 25 cents. Because the business enjoys a relatively good turnover of capital and because of the ample plant facilities and fair working capital position, an increase in production would not necessitate any additional capital expenses and the overhead and other standing expenses when prorated on a larger volume of units would naturally leave a larger margin of profit per car and per tangible assets than under a smaller output, other conditions being equal

This is why the motor companies are after large scale output, and why they can afford to scale down prices when their output increases.

In the first 9 months of the current year the company has earned $7.85 per share common, compared to $4.23 in the same period last year. On the basis of 1924 profits of $125 per car, should the company sell 140,000 cars, the common stock should earn nearly $17,000,000 or just about $9 per share. However, the operating profit, as we saw, tends to increase in years of large volume of sales, in accordance with the law of increased returns, and the company might earn this year $10 a share, were it not for the reduction in the prices of its various models. On this basis the current price of the stock of around $60 would not impress one as excessive.

Ratio of Preferred to Common Stock

Common stock, preferred stock: 9:1

The distribution of gross assets at the end of June, 1925, were as follows: Trade marks and patents 14.9 per cent; real estate and plant 43.5 per cent; investments .6 per cent; Citizens Homes Co. 1.2 per cent; deferred charges 2 per cent; inventories 18.2 per cent; accounts and notes receivable 8.2 per cent; cash 9.7 per cent and short time loans 3.5 per cent. Total current assets were 40.2 per cent of total gross assets. Total current liabilities consisted of 7.7 per cent of total gross liabilities (of which 5.6 per cent were accounts payable). Of the total gross liabilities the preferred stock was 6.2 per cent, the common stock 56.5 per cent and profit and loss surplus 23.4 per cent, with a special surplus of 4 per cent and miscellaneous reserves 2.2 per cent.

The net equity of the common stock on June 30, 1925, works out at $47 and the gross book equity, including special surplus reserves and without deductions for the intangible items, amounted to $61. In this equity net working capital was represented by $23 and cash alone by $9.50 per share. The $5.40 earned in the first 6 months amounted to 11.4 per cent and 8.8 per cent on the two respective equities — a highly satisfactory return.

It is clearly seen that the financial position of the company is such as to make the present dividend of $5 reasonably safe and with the comfortable position of the company an increase to as much as $6 is not impossible.

Finally, as indices of progress of the company, it might be mentioned that plant has increased nearly 6 times since 1911, net working capital over 2.5 times, inventories slightly over twice and net tangible assets 4.4 times. Net value of sales for the year 1925 is likely to be around the 1923 peak when it was 5.8 times as much as in 1911 and when the number of cars sold was 6.5 times the volume of 1911. And although, as already observed, it is possible that the company is laboring in some degree under over-expansion of plant, a compensating feature is the fact that the working capital of the company is at present being turned over nearly 5 times, or almost twice as rapidly as in the earlier years.

Explains Industry's Great Growth

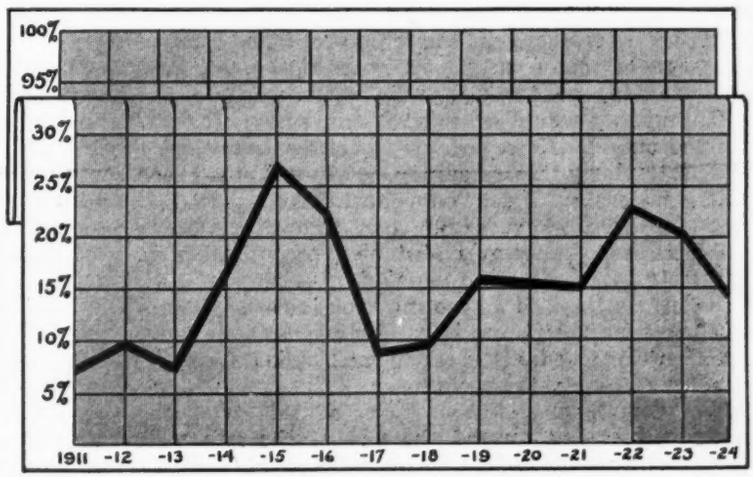
It is as a result of such efforts by this and other car and truck producing companies that the motor industry has climbed to a leading place among the principal industries of the nation in point of wholesale value of sales.

In 1924 the wholesale value of motor vehicles produced amounted to $3,163,000,000 against $3,154,000,000 for the wholesale value of steel mills and rolling mill products—and this on a capital investment of only $1,572,000,000.

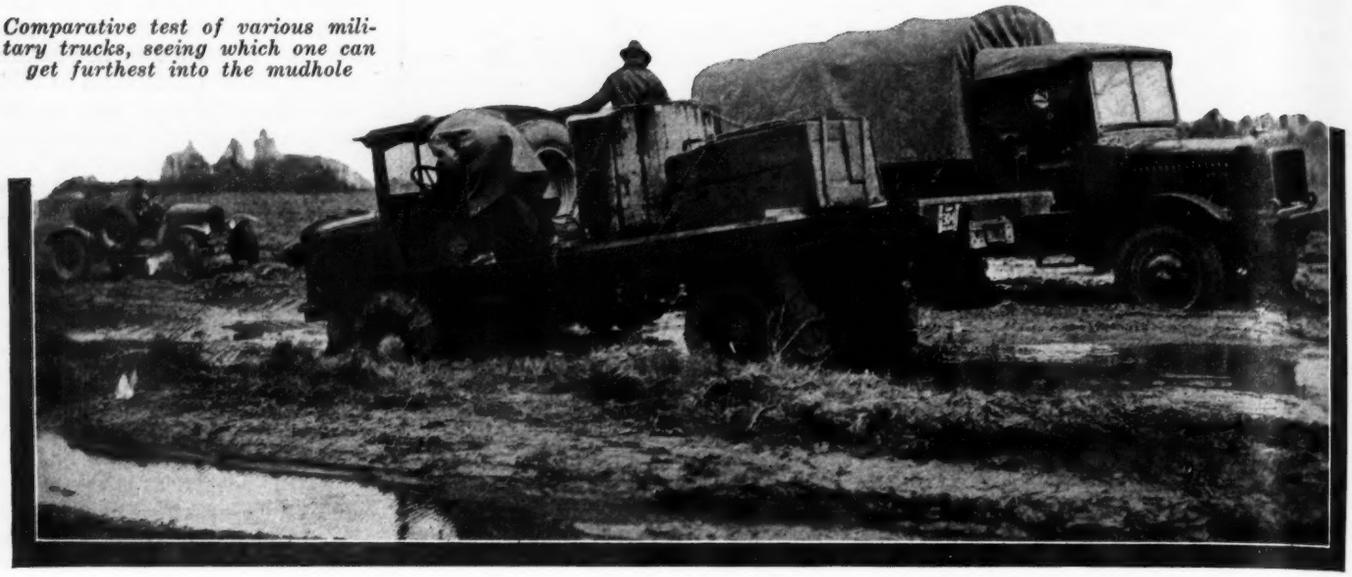
A truly remarkable achievement for an industry which is celebrating its first generation of life!

Per Cent Earned on Net Tangible Assets—1911 to 1924

1911— 7.32
1912— 9.81
1913— 7.46
1914—16.55
1915—26.92
1916—22.44
1917— 8.97
1918— 9.53
1919—15.62
1920—15.48
1921—15.25
1922—22.80
1923—20.77
1924—14.68



Studebaker's best year in point of percentage of net profit earned on net tangible assets was 1915 when the peak of 26.92 per cent was recorded. Other exceptionally good years in this respect were 1916, 1922 and 1923. A sharp decline occurred in 1924, but on the basis of 1925 business a climb toward the previous high levels can be expected again this year



Comparative test of various military trucks, seeing which one can get furthest into the mudhole

New Four-Wheel Drive Truck Proves Satisfactory in Army Tests

Vehicle built for service in rough terrain consists largely of stock parts. Has novel front drive and low gear of very large ratio. Steers easily. Product of Coleman Motors Corp.

By P. M. Heldt

WHEN horse vehicles were commonly used for military transport, practically the entire resources of a country in motive power for road transport were directly available for military service. To make suitable motorized equipment equally available to the armies in case of need, several European countries have introduced the bonus system, under which the Government pays part of the purchase price and part of the cost of maintenance of trucks purchased by private firms or individuals for commercial use, provided the trucks are built to meet certain specifications of the war departments and are kept in good working condition.

In this country, owing to the widespread and rapidly growing use of motor trucks in road haulage, trucks capable of doing substantially the same work as the Class B, probably would be available in sufficient numbers at the outset. However, for certain military operations, particularly cross-country work and near the front, it is necessary to use four-wheel drive trucks.

These trucks must have a high road clearance in order to be able to pass freely over obstacles; they must have an extremely low gear ratio, so that nothing can stall them as long as there is a "footing" for the wheels, and at the same time they must have a comparatively small high gear ratio, to enable them to make good speed on roads without racing their engines.

With a view to providing a truck of this type, the Militor was designed toward the end of the late war, and later on 75 trucks of this design were manufactured. While possessing certain excellent qualities, these trucks did not meet all of the requirements of the Army. The engine was of the old T-head type, which is not well adapted for operation on modern low grade fuels; all bearings of the engine were too small for sustained heavy duty service; the oil capacity was insufficient and, owing to the limited clearance over the front axle, it was impossible to correct this fault; the cooling capacity was inadequate; the range of gear ratios was insufficient; important parts were very inaccessible, the rear wheel assembly was excessively heavy and the wheel bearing adjustment was difficult to make. The vehicle, however, was very hard to steer.

Militor Rejected as Standard

About a year ago it was proposed to make the Militor the standard four-wheel drive cargo truck of the Army, but the proposal was not approved by the office of the Secretary of State. One reason was that the Militor was quite expensive to manufacture, owing to its special design, for which reason also there was little hope of seeing it adopted for commercial use to any extent.

Development work and tests of vehicles of this character are in charge of the Engineering Section, Motor Transport Division, Quartermaster Corps, which is located at Camp Holabird, Baltimore, A. W. Herrington being the engineer in charge. The Engineering Section realizes that while there are certain advantages to be gained by designing a truck especially for military service, these are outweighed by the advantage of being able to draw upon the commercial transport equipment of the country immediately upon the outbreak of hostilities. In any large scale defensive operation in this country

a large quantity of transport equipment would be needed immediately, and it would be impossible to allow the Army a year or more in which to equip itself, as was done during the late war.

The Engineering Section has been trying to solve this problem along one or the other of two possible lines—by either inducing some truck manufacturer to take up the manufacture of a suitable model, or by locating among commercially available trucks one with performance characteristics similar to those desired. It was in the pursuance of this object that the 1½-2 ton four-wheel drive truck was designed which was described in *Automotive Industries* of August 7, 1924.

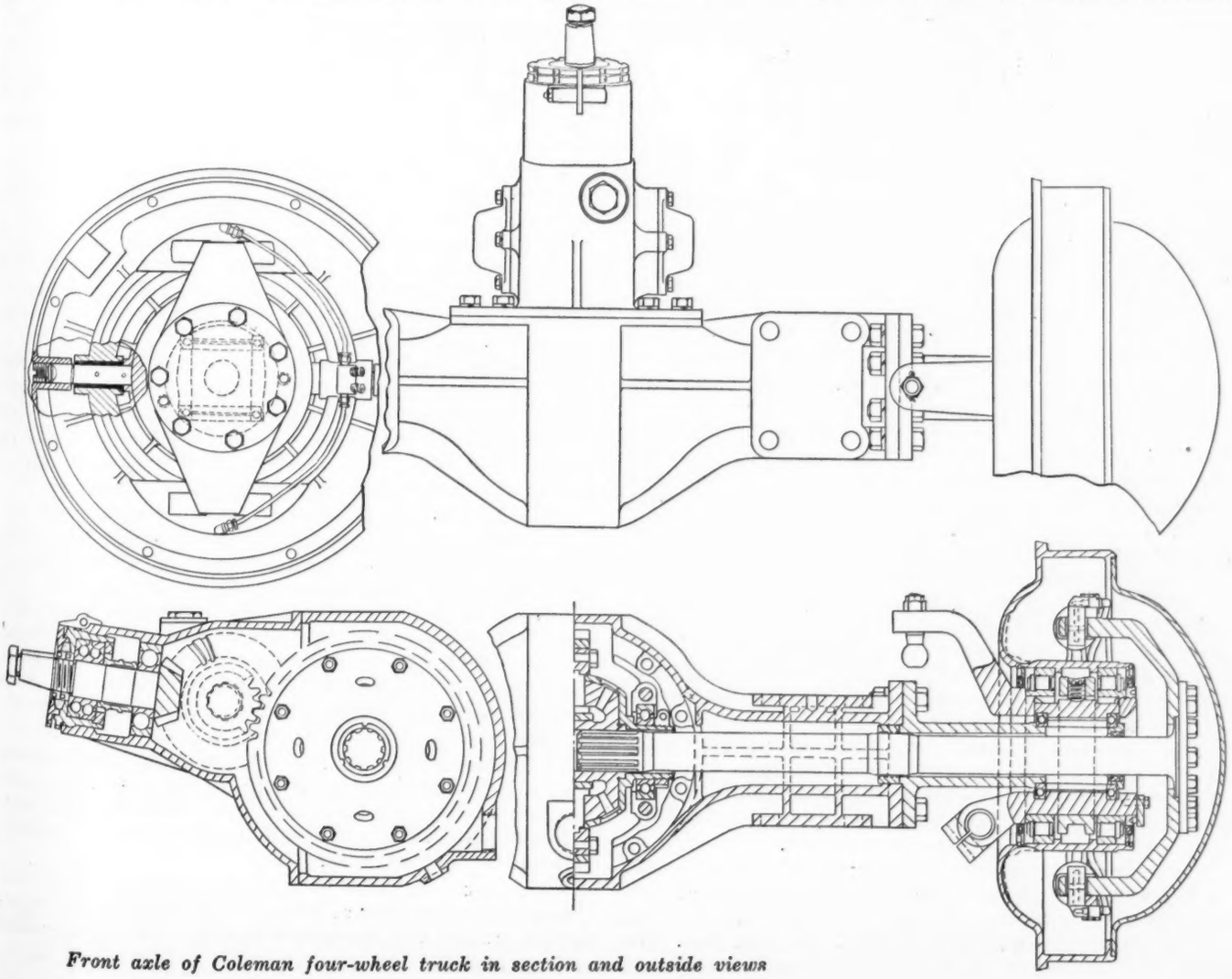
Designed for Rough Service

While this truck was under development, Mr. Herrington learned of a truck being built by the Coleman Motors Corp. of Littleton, Colo., for work in oil fields, mining and lumbering. This is a four-wheel drive truck with large road clearance and is designed throughout for use in undeveloped country or off the highways. A sample of this truck was obtained and has been under test for a considerable time, and the results with it are said to have been very satisfactory.

The Coleman four-wheel drive truck is largely assembled from standard parts. It is equipped with a Buda four-cylinder L-head engine of 4½ in. bore and 6 in. stroke, developing 51 hp. at 1,400 r.p.m. All bearings are lubricated by pressure from a submerged oil pump. The carbureter is a Stromberg 1¼ in. with air cleaner, ignition is by an American Bosch magneto with impulse starter and the radiator has a Rome Turney tubular core and a 22-in. fan which is driven by a 2-in. flat belt.

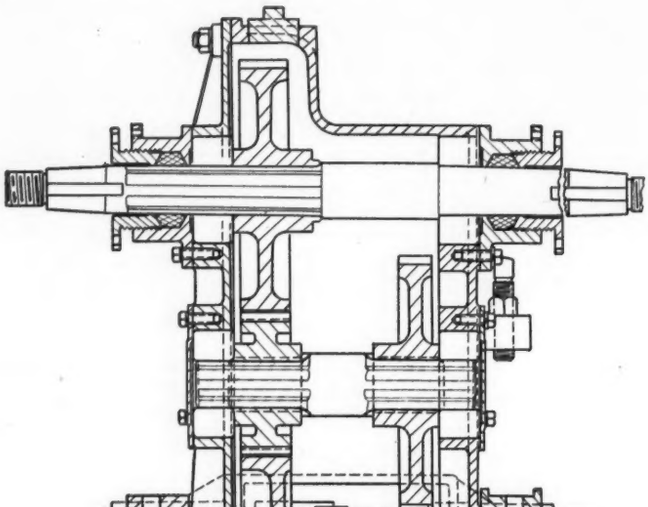
Test by the Quartermaster Corps. Coleman four-wheel drive truck assisting the Corps' six-wheel truck up a 20 per cent grade

Both the clutch and the transmission are standard units, the former being a Fuller multiple disk type enclosed in the bell housing of the engine, while the transmission is the Fuller four-speed truck type. In addition to the regular transmission, which is combined



Front axle of Coleman four-wheel truck in section and outside views

with the engine in a unit powerplant, there is a drop gearcase amidships through which the driving effort is divided between propeller shafts connecting to the front and rear driving axles, respectively, and which at the same time gives two gear ratios, a 1.1 and a 3.1 ratio. Either of these ratios can be combined with any of the ratios of the regular transmission, so that in reality eight forward speeds and two reverse speeds are provided. The ratios of reduction between the engine crankshaft and the drive wheels range from 8.57:1 (high gear) to 139.1 (low gear). Since the truck is fitted with giant pneumatic tires an air pump is bolted to the side of the transmission housing.



Drop gear of Coleman truck

The most interesting feature of the Coleman truck from the mechanical point of view is the front axle design, in which the usual arrangement of parts is reversed. A number of sectional views of this axle are shown herewith. The steering pivot is inside the front wheel hub and consists of thrust type ball bearings. The central part of this axle consists entirely of stock parts. It is, in fact, a Wisconsin Parts Co. double reduction type truck axle with its cast steel axle housing, gear carrier, differential and axle shafts.

To the flange on the outer end of each axle shaft is bolted a yoke which forms one member of a universal joint by which the power is transmitted to the front wheel, which, of course, must swing around its pivot in steering and therefore requires a driving connection through a universal joint.

The main axle housing ends just outside the spring pads in a flange, and has bolted to it a tubular extension which terminates in a vertical hollow cylinder, the top and bottom of which are counterbored to each receive a race of one of the ball thrust bearings.

The axle end is surrounded by what may be described as the stationary hub, a substantially cylindrical part with which are formed integral a bracket for the arm for the cross tie rod and the arm for the drag link. The other race of the lower ball thrust bearing (forming part of the steering pivot) is set directly into a seat machined in this stationary hub. A hole of the same diameter as the outer diameter of the seat for the thrust bearing is bored through the top of the stationary hub, and into this is inserted a plug which is turned with a shoulder to form a seat for the upper thrust bearing. The thrust bearings are adjusted by means of a headless set screw screwed through a steel ring surrounding the central part of the hub.

The front wheel bearings are of the roller type and are mounted directly on the stationary hub, one on its inner and the other on its outer end. In assembling, evidently the wheel is put over the stationary hub with only the inner roller bearing in position. Then the retaining ring for the thrust bearings is slipped on, and finally the outer roller bearing is put in place, secured by a ring nut with suitable locking means, and the set screw in the retaining ring is adjusted through a hole in the wheel hub.

From the yoke which is fastened to the flange at the end of the axle shaft the torque is conveyed through a pivot joint to a universal ring which through another pivot joint at right angles to the former connects to the wheel at both hub and rim. Suitable dust washers are provided at both ends of the wheel hub.

Drop Gear a Feature

Another feature of this truck is the two speed drop gear of which a vertical section is shown herewith. In all four-wheel drive trucks use is made of a drop gear, as the engine always sets quite high over the front axle, and the "drop" is required to secure a substantially straight drive through the propeller shafts. In the Coleman, advantage is taken of this drop gear to provide an additional gear ratio which can be combined with any of the four ratios in the regular transmission, so that in reality eight gear changes are available.

The other features of the truck may be briefly summarized: Gasoline is carried in two cylindrical tanks mounted under the truck platform at the sides, with a combined capacity of 43 gal. It is fed by the Stewart vacuum system to the Stromberg carbureter. Ignition is by an American Bosch magneto with impulse starter, and an American Bosch starter is also fitted. The storage battery is an Exide.

The drum for the service brake is 10 in. in diameter and 5 in. wide and is located on the propeller shaft. This brake therefore acts on all four wheels. For the emergency brakes there are two independent drums on each rear wheel, 15 in. and 20 in. in diameter, respectively. The emergency brakes are equalized.

All four wheels, which are made of cast steel, the rear ones being of the spoke type, are fitted with giant pneumatic tires, 42 by 9 in. in size. At 1,400 r.p.m. of the engine the truck has a speed of 22.5 m.p.h. The clearance under the axles is 15 in. at both front and rear. The drive is of the Hotchkiss type, there being no connection between the axles and the frame other than the semi-elliptic springs, which latter are of silico manganese steel, the front ones measuring 48 by 3½ and the rear ones 54 by 3½ in.

The frame is made of rolled channel steel of a section 7½ in. deep and weighing 9¾ lb. to the foot. It is quite flexible, there being no heavy cross members, but there are triangular braces at the rear to the point of attachment of the towing hook.

Without cab or body the chassis weighs 7,789 lb. and it has a load capacity of 5 tons. The tread is the standard 56 in. and the wheelbase 144 in. The frame width is 30 in. and the frame length back of the cab, 14 ft.

How Anti-Knock Fuels Make Possible More Miles Per Gallon

Theoretical investigation shows what improvement in fuel economy may be expected from any increase in compression ratios rendered practical by use of anti-detonating fuels.

By Stanwood W. Sparrow *

Automotive Power Plants Section, Bureau of Standards

IT is common knowledge that fuels superior in anti-knock value to present day products, if generally available, would make feasible the use of higher compression ratios and would thus make possible better fuel economy. (In reality fuel economy is dependent upon the expansion ratio but in conventional engines the compression and expansion ratios are equal and, unless the contrary is stated, it is assumed that a change in one ratio is accompanied by an equal change in the other ratio).

It is proposed to discuss briefly how the improvement in economy is brought about and how its magnitude may be predicted. For the purpose of this discussion, it will be convenient to consider the relation between compression ratio and (1) thermal efficiency, (2) engine size, and (3) mechanical efficiency.

In nearly all textbooks on thermodynamics will be found a discussion of what is called the "air cycle efficiency" of an internal combustion engine. This is given by the expression

$$E = 1 - \frac{1}{r^{n-1}}$$

where E is the air cycle efficiency; r the expansion ratio (which equals the compression ratio in conventional engines) and n the ratio between the specific heat at constant pressure and that at constant volume. For air, n has the approximate value of 1.4. There are theoretical and practical considerations which make it impossible for actual engines to attain the air cycle efficiencies†. The importance of these efficiencies, insofar as this discussion is concerned, lies in the fact that experiments have shown that the ratio between the actual thermal efficiency of an internal combustion engine and the air cycle efficiency remains practically constant when the compression ratio is changed. Hence the thermal efficiencies of two engines alike except with respect to compression ratio will bear the same relation to each other as do the air cycle efficiencies for those ratios‡. For example, one would expect an increase in indicated thermal efficiency of 17 per cent to result from increasing the compression ratio from 4.5 to 6.5, since Table 1, which gives air cycle efficiencies for a comparatively wide range of compression ratios, shows the efficiencies for these two ratios to be 0.452 and 0.527 and 0.527/0.452=1.17. The increase in mileage obtained per gallon of fuel would also be 17 per cent, provided the change in compression ratio did not change the mechanical efficiency. As will be pointed out later, the only change to be expected is a slight increase in the full load mechanical efficiency.

Compression Ratio Affects Energy

A change in compression ratio affects the amount of energy which the engine derives from a unit weight of charge, but not materially the amount of charge which enters the engine. Hence, the effect of such a change upon indicated horsepower is exactly the same as its effect upon indicated thermal efficiency, and is susceptible of calculation from the data given in Table 1. Engine size is dictated by the brake horsepower required, and hence the normal course, where the designer has a free hand, is for him to decrease the piston displacement as he increases the compression ratio so as to maintain the same brake horsepower output.

As has been stated, if the problem were one of indicated horsepower, its solution could be taken directly from Table 1, from which it is obvious that the piston displacement required for a 6.5 ratio would be 0.452/0.527=86 per cent of that required for a 4.5 ratio.

Since it is brake horsepower that is to be maintained constant, a further decrease in piston displacement is made possible by the fact that a slight increase in mechanical efficiency is brought about by an increase in compression ratio. This is a consequence of the fact that the increase in indicated horsepower is obtained with no appreciable change in the friction horsepower. As an illustration of how the magnitude of this effect may be calculated, assume a full load mechanical efficiency of 90 per cent for the 4.5 ration and that

x = indicated horsepower
$0.1x$ = friction horsepower
$0.9x$ = brake horsepower
$0.9x/x$ = 90 per cent = mechanical efficiency;

then, as previously shown for the 6.5 ratio,

$0.527x/0.452 = 1.17x$ = indicated horsepower
$0.1x$ = friction horsepower
$1.17x - 0.1x = 1.07x$ = brake horsepower
$1.07x/1.17x$ = 91.5 per cent = mechanical efficiency

*Published by permission of the Director of the National Bureau of Standards of the U. S. Department of Commerce.

† Some of these considerations are discussed in Technical Report No. 205 of the National Advisory Committee for Aeronautics, entitled "The Effect of Changes in Compression Ratio Upon Engine Performance."

‡ This fact was brought out by an extensive series of tests at the Bureau of Standards in which the experiments were made with compression ratios as high as 14 to 1. The results of these tests are summarized in Technical Report No. 205 of the National Advisory Committee for Aeronautics, entitled "The Effect of Changes in Compression Ratio Upon Engine Performance."

Similar calculations based on a full load mechanical efficiency of 80 per cent for the 4.5 ratio give a value of 82.9 per cent for the 6.5 ratio. For reasons which will be discussed in more detail later, it is assumed throughout the discussion that when a change is made in piston displacement there is a proportionate change in friction, so that a 10 per cent decrease in piston displacement, for example, is accompanied by a 10 per cent decrease in friction. Such being the case, mechanical efficiency is independent of piston displacement and hence the results of the above calculations, which refer to two engines of equal displacement but different power output, are equally correct for two engines of equal power output but of different piston displacements.

Table 1

Air-cycle efficiencies calculated from the relation

$$E = 1 - \frac{1}{r^{n-1}}$$

where

E = air cycle efficiency
r = compression ratio
n = 1.4

Compression Ratio	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	.000	.038	.071	.100	.126	.150	.172	.192	.210	.226
2	.242	.257	.271	.283	.296	.307	.318	.328	.338	.347
3	.356	.364	.372	.380	.387	.394	.401	.408	.414	.420
4	.426	.431	.437	.442	.447	.452	.457	.462	.466	.470
5	.475	.479	.483	.487	.491	.494	.498	.502	.505	.508
6	.511	.515	.518	.521	.524	.527	.530	.533	.535	.538
7	.541	.543	.546	.548	.551	.553	.556	.558	.560	.563
8	.564	.567	.569	.571	.573	.575	.577	.579	.581	.583
9	.585	.586	.588	.590	.592	.594	.595	.597	.599	.600
10	.602	.604	.605	.607	.608	.609	.611	.612	.614	.615

Taking into consideration all of the relations discussed thus far gives a piston displacement for the 6.5 ratio of

$$(0.452/0.527) \times (90.0/91.5) = 84.4 \text{ per cent}$$

of that required for the 4.5 ratio. If the full load mechanical efficiency of the engine with the 4.5 ratio had been assumed as 80 per cent instead of 90 per cent, the percentage would have been 82.8 instead of 84.4.

The motor car engine may be called upon to deliver its full power over a wide range of speeds, and its mechanical efficiency may be different at each speed. If an increase in compression ratio is to be made the engine designer is therefore faced with the problem of deciding which mechanical efficiency should be used as a basis for calculating the desirable change in piston displacement. It is probable that he will select the highest mechanical efficiency for that purpose, thus ensuring that at no speed will there be a reduction in engine performance due to the combined change of piston displacement and compression ratio but, on the contrary, a slight increase in brake horsepower at most speeds.

In the consideration of engine size it was necessary to touch upon the question of mechanical efficiency, and in so doing the assumption was made that friction bears a constant relation to piston displacement. This assumption is slightly incorrect, as the power required to drive certain of the engine auxiliaries is very nearly independent of engine size. The error, however, is probably only slight, since piston friction and pumping losses constitute the major portion of engine friction, and these would be expected to vary almost directly with piston displacement.

In calculating engine size, it was pointed out that for compression ratios of 6.5 and 4.5, indicated thermal efficiencies were in the ratio of 0.527 to 0.452 and, for the assumption made, full load mechanical efficiencies were in the ratio of 91.5 to 90.0. Since

$$(91.5/90.0) \times (0.527/0.452) = 1.185$$

the increase in full load mileage per gallon of fuel would be between 18 and 19 per cent. For an assumed mechanical efficiency of 80 per cent for the 4.5 ratio, the corresponding expression would be

$$(0.527/0.452) \times (82.9/80.0 = 1.207$$

and the increase in mileage would be between 20 and 21 per cent.

From a practical standpoint, fuel economy at part throttle is of most interest, since in actual service an automobile is operated but a small percentage of its time at full throttle. The power required to propel the ordinary motor car at moderate speeds on a level road is much less than the full power of the engine. As a consequence, the mechanical efficiency of the engine under such conditions is apt to be rather low, for while the friction of the engine is even greater that at full throttle, the power output (brake horsepower) is much less. As a result it is probable that the ordinary motor car engine operates much of the time at a mechanical efficiency of 50 per cent or less. Obviously, an increase in compression ratio does not appreciably alter the power required to propel the car at a given speed. It does, however, make it possible for this power to be developed with an engine of less piston displacement and having, therefore, less friction. With certain assumptions made previously, it was calculated that the piston displacement required with a 6.5 ratio was about 84 per cent of that required with a 4.5 ratio, and that the friction was in the same ratio. The next step is to estimate the effect of this change at the low mechanical efficiencies encountered at part throttle. For the 4.5 ratio let

$0.50x$ = brake horsepower
$0.50x$ = friction horsepower
$0.50x + 0.50x = x$ = indicated horsepower
$0.50x/x = 50$ per cent = mechanical efficiency

Then, for the same brake horsepower output with the 6.5 ratio

$0.50x$ = brake horsepower
$0.84\ (.50x) = .42x$ = friction horsepower
$0.50x + .42x = .92x$ = indicated horsepower
$0.50x/0.92x = 54.4$ per cent = mechanical efficiency

Since

$$(0.527/0.452) \times (54.4/50.0) = 127$$

an increase in part throttle mileage per gallon of fuel of 27 per cent would be expected from the increase in compression ratio.

Minor Influences Neglected

Certain minor influences have been neglected in this discussion. For example, a change in piston displacement would be accompanied by a change in engine weight, and, consequently, in the power required to propel the vehicle. The probable amount of change in the total weight of the automobile, however, is too small to merit consideration. The use of a leaner mixture at extremely low loads may be made possible by an increase in compression ratio. Slightly less spark advance will be required as the compression ratio is increased. All these and other influences may cause the effect of a specific change in the compression ratio to differ slightly from the value calculated above. Nevertheless it is believed that by these relations it is possible—once the increase in compression ratio that the use of a special fuel permits, has been determined—to predict with fair accuracy what increase in miles per gallon of fuel can be obtained.

Just Among Ourselves

What About Financing Subsidies?

CAR manufacturers are talking among themselves about the question of subsidies to finance companies in connection with financing arrangements made for the benefit of wholesalers and dealers. Opinion is somewhat divided, as is indicated by the difference in the plans which recently have been adopted. Some of these involve what amounts to a subsidy by the car manufacturer, thus permitting a lower rate to the public than otherwise would be possible. In other cases the factory-finance company arrangements involve no subsidy, the manufacturers in these cases feeling that they should not be called upon to pay for the individual buyer part of the cost of the financial assistance extended to him. How much sales value is there in a $15 difference between financing charges on a $1,500 car? That is the question that a good many executives are asking themselves. One answer is that it depends on the salesman—but there are a number of other answers as well. It is probable that the final one will not be given until further experience helps to develop more detailed data about results.

Jay-Walking; Can It Be Made Efficient?

IF you can't get rid of jay-walkers, encourage them to be efficient jay-walkers. That's the Philadelphia plan now being propounded by the Citizens Safety Council of the Philadelphia Chamber of Commerce. A pamphlet recently issued by this organization points out that "the average high-powered American is a natural born jay-walker," but that some of them are mighty poor hands at the game. If you have to jay-walk, the Philadelphia plan urges, "at least avoid taking foolish chances. Pause a moment, study the situation, look both ways and then set sail only when you can see the thing safely through." There is much reason in the idea. Traffic experts may continue to inveigh against jay-walking but we feel a lot safer in many cases crossing in a quiet sector between corners than shoving our way through a seething mass of slow-moving humanity at a street intersection with cars turning corners and without room to cut and run if the whistle blows just as we reach mid-stream. We're noted as one of the most nimble and nervous pedestrians in these parts, however, so maybe our judgment is biased. We do believe there is much to be said, nevertheless, in favor of intelligent jay-walking.

Labor Costs—How Do They Affect Selling Price?

ONE newspaper writer, commenting on our recent article, entitled "Has Ford Lost His Big Sales Punch?" suggests that one result of the increasing competition Ford is experiencing may be the end of the Ford $6 a day minimum wage plan. Personally we can't see any likelihood of such a result. To begin with, there isn't any great disparity between the average wage of Ford workers and the average wage of workers in other Detroit automobile plants. In the second place, if Ford were to bring out an entirely new model, the proportion which a few cents a day per worker would bear to the other manufacturing expenses and operating charges involved would be so small as to be of very little importance from a direct cost standpoint, while the possibilities of decreased efficiency through dissatisfaction with a wage cut might be important. Generally speaking in industry, there has been a strong tendency to over-estimate the importance of the wage level as an influence on selling price. While the figure would differ materially from plant to plant, in a good many automotive establishments a wage cut of 10 per cent could affect the f.o.b. price by less than 1 per cent, because of the proportion borne to total costs by the labor costs.

Closed Car Totals Continue to Mount

ANOTHER substantial increase in the percentage of closed cars produced has been recorded this year. Estimates last year for the percentage of total production comprised of closed models ranged from 38 to 43 per cent. This year it looks as though the percentage might go over 50 for the first time. Certainly more than half the cars built in 1925 would have been closed had it not been for the difficulties experienced by Ford in getting into production his new models of this type in the Fall. The proportion of closed jobs ran well over the 50 per cent mark last year on all except the low priced vehicles. The proportion in the $1000-$2000 class in 1924 was 70.7 per cent; in the $2000-$3000 class, 76.9 per cent, and in the "over $3000" group, 90 per cent. This year it is likely that—Ford excepted—the average will be in excess of 70 per cent. This is accounted for partly by the general increase in percentage of closed cars built and partly by the exceptional increase in output of Hudson-Essex which specializes entirely on closed jobs. The total output of closed automobiles in the United States and Canada this year probably will be somewhere around 2,100,000. N.G.S.

Ten Traps in Overseas

Things are not always what they seem to be for the automotive manufacturer who seeks foreign trade, yet the business is there and can be gained if gone after properly.

THE author of this article is a well known combination export manager who handles the foreign business of seven large American automotive accessory companies. He has been actively engaged in his present work for the last eight years and before entering business for himself had worked for several export houses and a large manufacturer of electrical accessories.

He organized the Overseas Club of Automotive Boosters in 1923 and has been a prominent figure in its activities.

H. L. Kraus

TRADE papers for the past several years have recorded increased activities on the part of the large automotive manufacturers in their efforts to secure overseas business. The automotive division of the Bureau of Foreign and Domestic Commerce has reflected this intense activity in increased exports in practically all countries of the world.

The larger automotive units with their tremendous potential output have wisely realized that their largest undeveloped market is overseas. Having adequate finances and a well-rounded organization, they are in a position to go after overseas business aggressively, intensively and intelligently. They are securing it, too.

Where a particular market's development is held back because of lack of roads, they endeavor to get new roads built and financed. At the Good Roads Meeting held in Detroit last year, road building engineers from a great many countries were invited as guests of the American car factories to see the benefits of road development.

Where local conditions adversely affect direct shipment from the States, many large factories have established local assembly plants or factories. In some cases, on account of high ocean freight rates, steamers have been purchased for the sole purpose of shipping cars and parts. Prominent executives have gone overseas themselves to establish personal contacts and familiarize themselves with actual conditions. The small or medium-sized manufacturer seeing all this activity and bustle—and orders—naturally wants to get his share of the orders.

Unfortunately, with none of the organization or the finances of the larger firms, he is unable to apply the same thorough, intensive methods which the big producers do in tackling the many problems which overseas business brings up. Often he is dazzled by the romance of shipping across oceans and foreign lands and entirely too often is the victim of the overseas impostor, loses money and becomes another gravestone in the export cemetery.

There are a number of traps to be avoided in successfully selling overseas. Why not let's be honest and realize that overseas selling in the automotive and accessory field is just as difficult—if not more so—than selling in the domestic market. There are obstacles in differences in language, temperament, political, economic and social conditions which are not found in the States. What are some of the difficulties? Here are a few:

1 *Overestimating the market.* A glance at the world map shows the United States a small part of the world's surface. Yet, an automotive map would show nearly 17,000,000 passenger cars in the United States and less than 2,000,000 passenger cars overseas for which we can sell our equipment.

While the registration figures show approximately 4,000,000 cars outside of the United States, these must be discounted a great deal. Great Britain, as a market, is almost entirely closed to American accessory and equipment manufacturers. A few American accessories and parts are being sold there but the new McKenna tariff taxing automotive material 33 1/3 per cent effectively closes out most accessories. The only solutions are assembly plants or a royalty arrangement with a British manufacturer. Germany and France with a fairly large car registration must also be discounted materially, as the majority of these cars are European

Sales

By H. L. Kraus

cars and are not usually designed for American equipment. It must be remembered, of course, that here, as always, there are exceptions.

Some markets in other territories have cumulative car registration, a great many cars being counted which long since have gone to the junk yards. At its best, the overseas market at the present time will not yield more than 15 per cent of a factory's business. This will increase, we hope.

2 *Poor sales organizations.* Most automotive manufacturers have been solicited by importers overseas and export houses in this country, who want territory on an exclusive basis. It is safe to state that some export houses and importers abroad ask for a lot of territory they cannot efficiently work. On the other hand there are splendid firms here and abroad which have fine selling organizations in their respective territories. The hard part is to pick'em. Some firms want exclusive agencies only as a means of keeping out competition either real or fancied.

Permanent exhibits on ships or on shore and other fantastic schemes which are put up to gullible manufacturers at frequent intervals have never worked out satisfactorily and probably never will. Every factory and every product requires individual treatment and no ready-made plan can be found to fit any number of factories. Every sales proposition must be made to order to fit the particular product and the particular factory and its policies.

3 *Poor agents overseas.* The amateur in exporting will usually pass out exclusive agencies to the first one writing for them under the theory that the factory has no business anyway and whatever efforts the unknown puts in will be so much advertising and so much ground work for succeeding efforts. Besides, he is an optimist and usually hopes the arrangement may work out, anyway.

Tremendous amounts of money have been lost in this way in samples, drawing account advances, in the waste of perfectly good literature, letters, etc. More important is the loss in good-will and prestige through some inefficient individual attempting to peddle a line in a foreign market.

4 *Quoting prices indiscriminately.* This is a very common failing which is doing a tremendous lot of harm to the American maufacturer. The negro in West Africa and the native boy in India and other parts of the Far East has a perfect mania for writing letters to the American manufacturers. In many cases, he has been successful in securing some very nice samples which he promptly sells. Even if he doesn't get the samples, he usually gets a big bunch of letters which make him appear important to the postman and to the rest of the village.

On a recent trip to a small Central American country, I visited a dealer whose name had been on all trade lists and who has corresponded continuously and at length with a great many manufacturers. His desk was piled high with catalogues, trade papers and samples sent by American manufacturers soliciting his business. The total sales of this fellow—you see he was lots better than many of the others, he actually had a place of business and sold goods—was probably $3,000 a year, yet the cost of the printed matter, postage, etc., on his desk represented several hundred dollars, and he received as much as this by every mail. I am sure that the American manufacturers spend $3,000 in securing this $3,000 worth of business.

5 *Overstocking and underselling.* Most markets are comparatively small. The American manufacturer used to selling in large units based on domestic sales, works up sales plans, designed to sell overseas the same unit he is accustomed to selling in the States. The average foreign importer in the smaller territory somewhat unfamiliar with this high pressure stuff buys more than he needs. The result often is inability to move the

goods. Then price cutting makes its appearance and the market is demoralized for a long, long time.

Underselling is another evil closely allied to overbuying. Opportunities for business in the smaller markets are few. Caste lines are hard drawn. Professions are overcrowded. Most countries have ten times more lawyers with nothing to go to law about and more doctors with nobody to doctor than they need, all products of small colleges in their home town. The sons of the leading families consider it a disgrace to go to work, physically. With the advent of the automobile, an entirely new field was opened to these white collar boys, who looked upon importing as a useful outlet for their energies and a fitting occupation for a gentleman of their rank. Even though they didn't do much business, they were still importers, prominent members of the community. They insist on buying direct from the American manufacturer in dribs and drabs and paying outrageously high carrying charges, etc., rather than place orders with other importers in their own country. As these merchants haven't the slightest conception of good merchandising, the results are pitiful. In a country of 2,000 cars one is liable to find one hundred concerns which want to buy from the original source of supply.

6 *Unstable economic and political conditions.* Fluctuations in exchange are sometimes 45 to 50 per cent in the course of an order. As it takes 4 to 6 months in some cases for an order to turn around, the goods may cost $40 or $50 more or less per $100 unit to land than originally contemplated. One can readily realize how impossible it is to maintain any firm resale schedule such as manufacturers attempt to maintain in the States.

Many countries are one-commodity countries, basing their entire prosperity on a single product. If rubber, sugar, coffee, cotton, nitrates, cocoa or what-not prices are high, business is fine and everybody buys his head off. Should the market slump everyone immediately crawls into a hole and takes the hole in after him. Orders on the way are cancelled or repudiated. Stocks on hand are sacrificed to provide ready cash to meet pending obligations.

Political Upheavals Common

Political conditions affect business too much in many countries. Government officials are often grafting. Sales to the Government are paid for in paper redeemed if the Government succeeds in getting the taxes from the tax collectors before the tax collectors leave the country. In one city, the mayor had the pleasant habit of sending all his friends down to a garage and having gas and oil charged to the city account. The poor garage man had several thousand dollars in accounts against the city. He was promised payment when the next fiscal year came around as the city administration had spent all its money and could borrow no more.

7 *Lower standards of commercial integrity.* The unstable financial, economic and political conditions mentioned in the previous section have a natural tendency to breed speculation. Speculating profits are more desired than merchandising profits. The desire for long terms and the request for extensions in the face of falling exchange are all reflections of speculation. The importer hopes that the exchange will improve before he has to pay the bill. If it doesn't he asks for another extension. If it does he makes a neat profit for he has sold his goods based on the higher exchange rates.

The non-payment of drafts at maturity is too often taken as a matter of course. The slightest excuse is quickly grasped as a reason for not meeting an obligation. This isn't universal, fortunately, but it is entirely too prevalent in certain markets.

In many countries, the local laws are definitely written to hurt the American exporter whenever possible. The formulae for protesting drafts, making up invoices, marking cases, etc., vary tremendously with every little market and the manufacturer who makes a mistake had better watch his step for quite a few smaller countries have a pleasant system of giving the inspector 50 per cent of the fine he is able to collect.

8 *Piracy of trademarks and patents.* To properly protect trademarks and patents costs a good deal of money and many manufacturers overlook this procedure entirely. Quite often this results rather expensively. Trademark laws and patent laws vary considerably. In many countries, the first one to register a mark is its sole possessor and is in a position to confiscate the imports of the actual manufacturer.

The German Disk Wheel Patent

There is now an actual example of a man in Germany threatening to hold up all American automobiles with disk wheels, claiming the patent on them. Several years ago, a Spaniard succeeded in registering the trademarks of all the large American automobiles and it took the combined efforts of the State Department and many government agencies to dislodge him. A few weeks ago a disgruntled representative in the Argentine registered the trademarks of the manufacturer whose lines he formerly sold. By the merest chance, a New York attorney saw the notice and notified the companies interested who were able to stop him.

9 *Home competition.* Australia, England, Cuba, Argentine, Scandinavia, France and a great many other markets have tariffs which are responsible in protecting their own industries. Although we wail over prohibitive tariffs in overseas markets, we forget that we also erect tariff walls against others in the States. It is wise to investigate carefully beforehand to ascertain in what markets a product can be sold. Many markets are closed, even though it would seem that they ought to buy from us on account of a large car registration.

We must watch not only for a definite tariff wall but for individual idiosyncrasies such as prohibition of nickel plating which exists in certain countries. In one market, for example, a rubber cement can be imported free of charge as a chemical. Put it up in a bottle with a label on it and it becomes an automobile accessory at a 45 per cent duty. In some markets spotlights are prohibited; in others electric horns.

10 *Ignorant American competition.* This is becoming the most important handicap to worthwhile business. What good does an intelligent export policy do if a competitor throws a monkey wrench into the machinery? Australia, South Africa, Argentina, England and a good many of the other larger and better organized markets are trying very hard to maintain jobbing standards, patterned after American policies. To accomplish this reform would eliminate many of the evils mentioned before. But listen. A small dealer in any of these markets writes to a manufacturer, who is seriously and intelligently attempting to do overseas business. His request is politely referred to a nearby distributor. A similar letter goes to another manufacturer, who immediately quotes the maximum jobbing policies and throws in an extra 10 per cent besides because he doesn't have any salesmen to pay as he has in the States. What chance has the first manufacturer? Or the local distributor for the first manufacturer? What chance has the whole industry when every little dealer knows the maximum price, and gets it for a ridiculously small order?

Export business is no different from domestic business. This is a bromide but a true one. Good export managers keep saying this over and over again. A manufacturer would not look at a map of the States, see Texas so much larger than Rhode Island and expect proportionately more business. He would not give the agency of his line for all the territory West of the Mississippi to a jobber in Chicago who doesn't sell outside of Cook County. He would not turn his line over to an unskilled farm boy, who happened to write him a letter asking for it. He would not quote maximum distributors' prices to a roadside garage simply to get a single order. He would not knowingly sell a dealer, whom he knows doesn't pay bills promptly or who uses the proceeds to play the races in hope of getting money quickly. He would not expect much business from a town embargoed by the railroads or which has just been visited by a tornado. Yet hundreds and hundreds of American manufacturers in the automotive industry are doing worse things than this in the foreign field and when they suffer accordingly, promptly and vigorously maintain that export business simply isn't worth bothering about. Neither would domestic business if it were handled in the same slip-shod, careless manner.

The overseas field for automotive equipment, parts and accessories is growing and will continue to grow. Applying the same standards of common sense that he uses in the States, the manufacturer will secure a proportionate share of overseas business.

The market is a good one, but on account of the vast distances which have to be covered, length of time required in the interchange of correspondence, the differences in languages and in living conditions, the complexity of laws, regulations and tariffs, the manufacturer must go into the field with his eyes open, knowing absolutely what he is doing, and then going ahead, intelligently, sanely, constructively and conscientiously, and doing it!

Republic Truck Announces Two New Models

MODEL 25-6, a new Republic 3-ton truck, has been designed for fast, long distance, merchandise transportation and has a low center of gravity and pneumatic tires all around. The engine used is a Continental six cylinder, 3¾ by 5 in. with four bearing counter balanced crankshaft. The double drum driveshaft brake used is an exclusive Republic feature. The frame is 7 in. deep and 164 in. long from dash to the rear axle. From the dash to the rear end of the frame is 229 in. and the wheel base is 202 in. Wheels are steel disk mounting 36 by 6 in. pneumatic tires with duals on the rear.

Another new Republic product is Model 85-RB, a 1½ ton gravity dump truck. Its wheel base is only 110 in. making for easy handling. All steel spoke type wheels are used with 32 by 6 in. pneumatic tires. A feature of this truck is the platform spring construction with heavy transverse spring across the rear end.

AN aviators' beacon visible at distances in the air of 20 to 30 miles has been installed by the Atlantic Refining Co. on its new Philadelphia office building. The beacon was designed and installed by the B. B. T. Corp. It contains a flashing mechanism which will flash the light on five seconds and off five seconds. This will serve to distinguish the beacon from other city lights and will enable aviators to determine their exact position in relation with the Philadelphia flying field. This installation is said to be the first to be made by a civilian organization.

Below—Republic 3-ton high speed truck. Right—Rear end of dump truck showing platform spring construction with transverse spring across rear end

Straight Line Production Attained in Wooden Body Building

Part II

Many novel machines and methods are used by the Murray Body Corporation in building bodies. Detailed description of manufacturing processes at Bay City Plant.

By Walter L. Carver

THE operations described in the first part of this article, appearing in last week's *Automotive Industries*, are more or less preliminary to the actual shaping and final finishing of the more complicated parts. These steps can be followed to best advantage by tracing the progress of two or three typical pieces.

After the roughly profiled sills leave the scroll saws, they are delivered to a line of Baxter D. Whitney square shapers where the outline of the sill is finished. In the shaping operation, the sill is clamped to a wooden fixture, the base of which forms a master form. In the square shaping machines a vertical spindle which projects upward from the table of the machine carries four cutter blades which may be formed or straight in accordance with the desired contour of the finished surface. At the base of the cutter head, a ring which is concentric with the path of the cutter edges serves as the guide for the master form at the base of the fixture. By forcing the master form against the ring and traversing the loaded fixture the profile is cut. Fig. 10 shows a line of these machines for shaping roof rails while Fig. 11, shows a pillar line.

Shapers Have Two Cutter Heads

Most of the square shapers in the finishing line are fitted with two cutter heads which rotate at about 7200 r. p. m. in opposite directions. The cut along one side of a piece is started at the middle and run out at one end. The fixture is then returned to the middle position and the cut is taken to the other end on the second cutter head. This procedure is followed to prevent splitting along the grain at the ends of the piece, which would occur if the cutter were to be fed against the butt end of the stock. Considerable skill is required for shaping around the joints between two parts which are glued together as are rear door posts, door frames, etc.

After the general finished outline has been produced in the square shaper line, the sill goes on to the detail shapers, each of which performs a specific operation. In sill production these shapers are used to cut out the rabbetted ledges for floor boards, the clearance for frame rivet heads, etc. From this operation, sills are passed to a Tannowitz mitre saw for a gaining operation which forms the ends for the joints with the rear kick-up assembly and the dash frame respectively. Fig. 12 shows a gaining operation which is conducted simultaneously by three heads.

In the next machine, a Greenlee hollow chisel mortiser as illustrated by Fig. 13, the pockets for the cross sills are formed. This machine also is without parallel in metal shop work. The head which descends carries a fixed tool of hollow rectangular section which forms the outline of the mortise. Inside of this tool a bit having a diameter slightly smaller than the inside width of the hollow chisel rotates. In descending, the bit removes the core of the mortise and leaves but a slight shaving cut for the chisel which performs the finishing operation. If the width of the mortise is greater than that of the hollow chisel, the part is shifted by the required amount after the first operation and a repetition of the operation completes the job.

At this point the sill is practically complete and is passed to a Pringle & Brodie gang drill where the holes for chassis hold-down bolts are drilled. The machine is illustrated by Fig. 14 and the operation is altogether similar to the multiple spindle operations in the machine shop although no jig bushings are used and the table elevates the sill to the drills instead of the drill head descending.

Reinforcing Laminated Sill

In order to reinforce the laminated sill several wood screws are set at intervals along its length. This work is performed in a Reynold screw machine as illustrated by Fig. 15. Two treadles operate separate heads one of which carries a pilot bit and countersink and the other a hopper and a driver. The operator first brings down the pilot bit which drills a hole somewhat smaller and shorter than the screw and a countersink for the head and then shifts the sill slightly and depresses the other treadle which controls the mechanism for delivering a screw from the rotating hopper to the opening of the head and finally drives the screw.

Following this operation the sill is given final inspection. A scribed wodden templet is placed over each sill and various openings, pockets and clearances are checked. These wooden inspection templets are used liberally throughout the line beginning with the square shapers,

Part 1 of the accompanying article appeared in last week's issue. This is the final instalment.

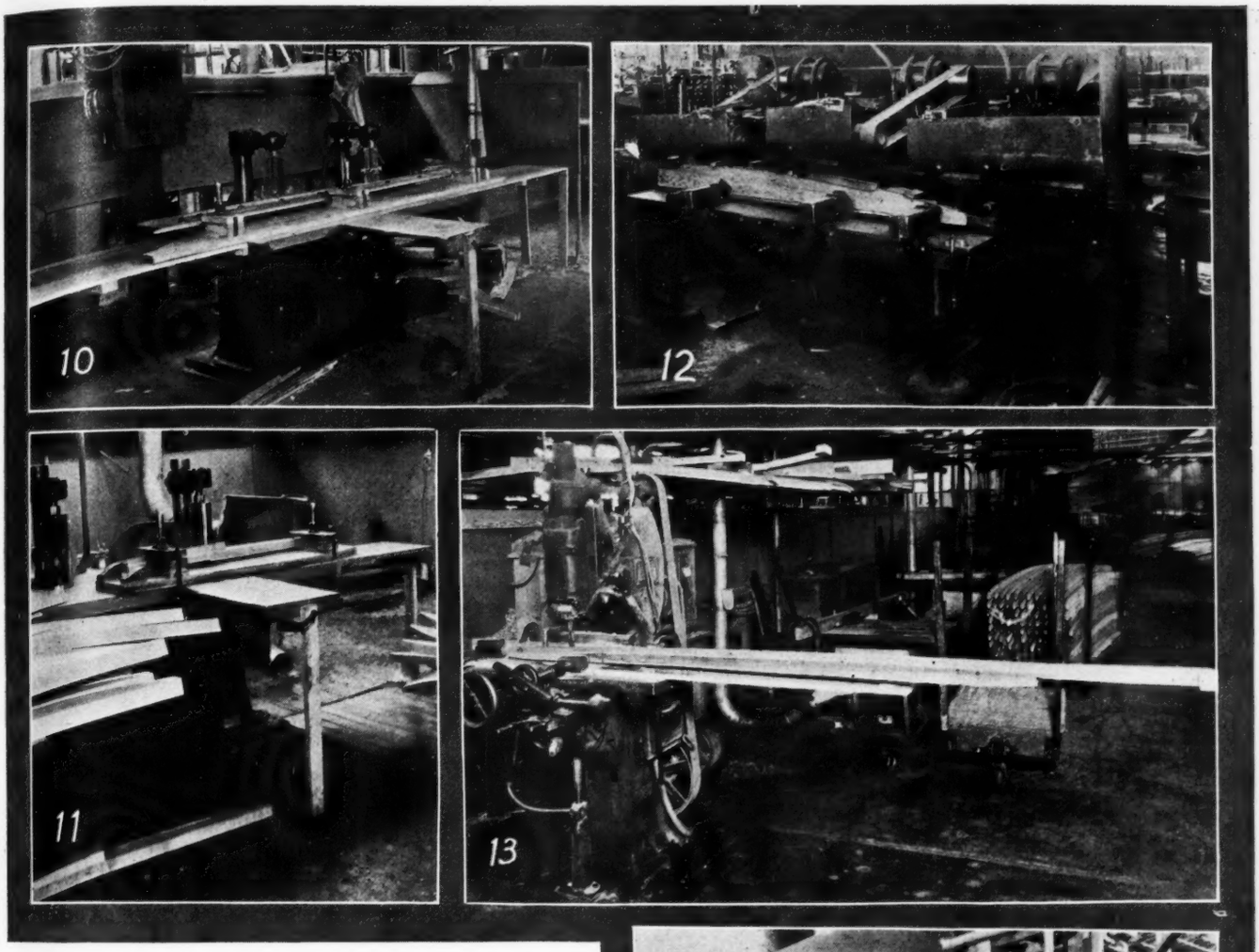


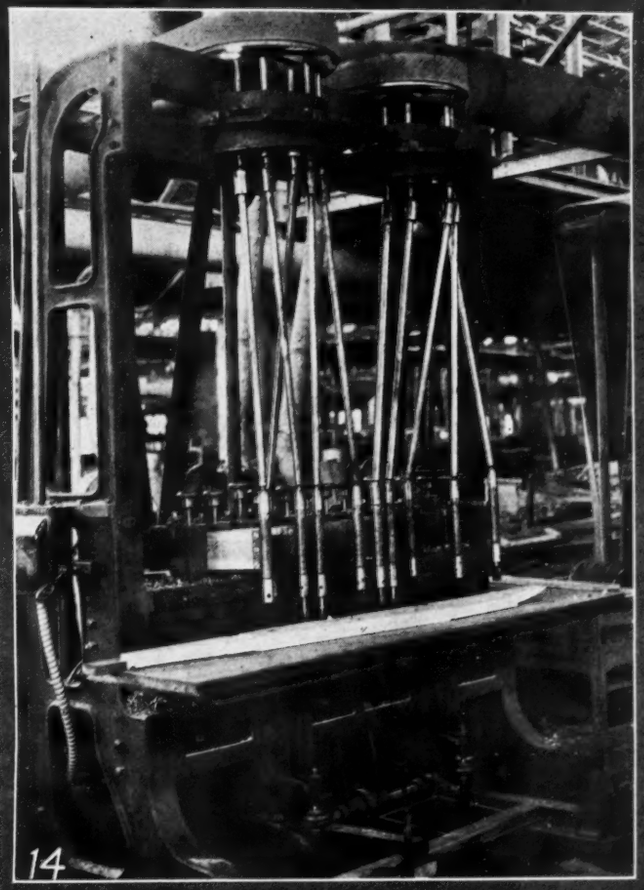
Fig. 10. Square shaper line for sedan roof rails. Fig. 11. Square shaper line for door pillars. Fig. 12. Three-headed gainer. Note pneumatic rams which clamp work. Fig. 13. Hollow chisel mortiser operation on roof rail. Preparing joint for door pillar. Fig. 14. Multiple spindle drill used for drilling chassis bolt holes or similar uses.

there being one for each stage of completion of the major operations. Sills are then stacked on the wheeled trucks which show in many of the illustrations and are delivered through a transfer aisle to the shipping department which is located at the northeast corner of the plant.

Operations of Roof Rails

Operations of the roof rails follow the same general scheme and sequence as those of the sills. However in one particular case where the rail embodies the curved and rounded edge along the outside and curved visor projection at the front, the square shaper, and gainer operations are more elaborate. While the holes for door pillars are machined in hollow chisel mortisers, the mortises for top bows are machined in a Greenlee oscillating mortiser as shown in Fig. 16. In this machine a tool resembling an end mill is swept back and forth in the arc of a circle for the length of the desired cut and the piece which has already been placed in a fixture is advanced to produce the proper depth. As this operation as well as some of the others leave shreds or splinters at the ends of various cuts, a clean-up operation is included in the rail program.

Following this operation, roof rails are passed through a belt sanding operation as shown in Fig. 17, where surfaces which are to be finished in the complete body are



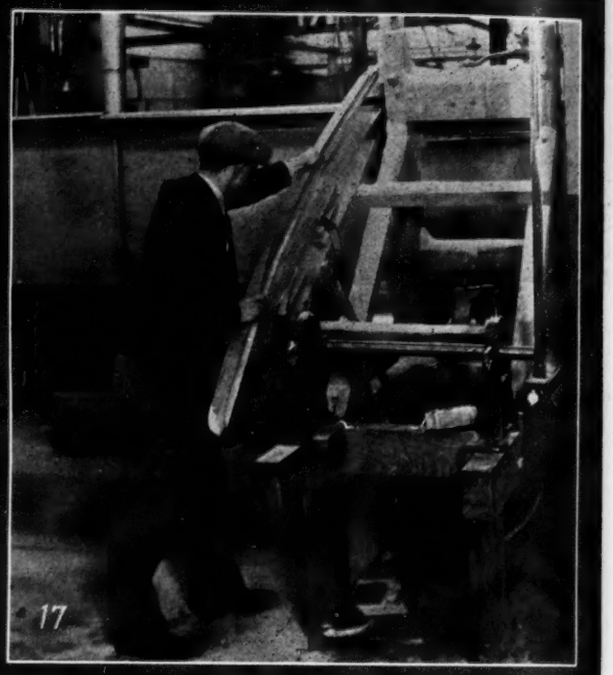


Fig. 15. Reynolds screw driving machine. First spindle spots hole and countersink while second sets screw. Fig. 16. Oscillating mortiser preparing holes for top bows in roof rail. Fig. 17. Belt sander which performs final finishing operation on many parts

smoothed. This operation also is applied to the exposed faces of door frames and on some parts of door pillars. The sander illustrated was designed and built in this shop.

Door frames follow about the same general routine as described for the previous parts. All members are designed for mortise joints and the production of tenon ends is handled in most cases in a double end tenoning machine as illustrated by Fig. 18. As shown here, cross pieces and similar parts which have come from the stickers are first cut to length and then the tenons are cut in one pass through the machine.

All of the parts for a complete door frame are delivered to assembly lines, where wood fixtures are used to insure accuracy of dimension. As shown in Fig. 19, parts are roughly assembled with an application of glue at all joints and then are set up and clamped in these fixtures. Following this wood screws are driven at the major joints, the location holes and countersinks having been produced in the machine line. After the frame is locked together, it is removed from the fixture and all joints are brushed with hot water to remove excess glue. Then the complete door is passed through a square shaper line for the production of assembled contour and outline.

Frames Passed Over Master Fixture

All door frames are passed over master fixtures, one of which is illustrated by Fig. 20. Inasmuch as every part of the body is designed and produced to practically drop into its place in the body frame assembly, the contour of the completed door frames is a very important item and errors at this point would partially nullify the entire plan by causing excessive expense for the door hanging operation. Each door is tested for outline dimensions and the molded contour of the body. If the frame does not lay snugly in the jig at all points, it is reworked by springing or resetting some of the joints. The method and means of handling material throughout the shop is illustrated very well by Fig. 21, which shows a number of completed door frames and some of the component parts which are ready for delivery to the assembly operation. Before shipment all parts are sluiced with creosote paint to preserve the desired moisture content during the period en route to the Detroit plant.

Steam forming operations have no place in this plant as the cost of the process is more than offset by the simplicity of manufacture and the economy of material in the present methods. In the case of curved top bows, random widths are passed through the Linderman machine to form a board of considerable width. After the necessary operations, this board goes to the scroll band saws where a guide is used to saw the bows to actual contour. The only losses of material are one long narrow convex piece at one side and the two wedges from the opposite side of the board.

As mentioned previously, sills are not completely assembled at this plant. The kick-up over the rear axle is eliminated to conserve shipping space, therefore the main section is drilled for the attachment of the rear member which is composed of two shaped parts which are glued and screwed together. In turn this member is arranged for ready assembly when the parts are received in the frame assembly shop in Detroit. This practice holds for

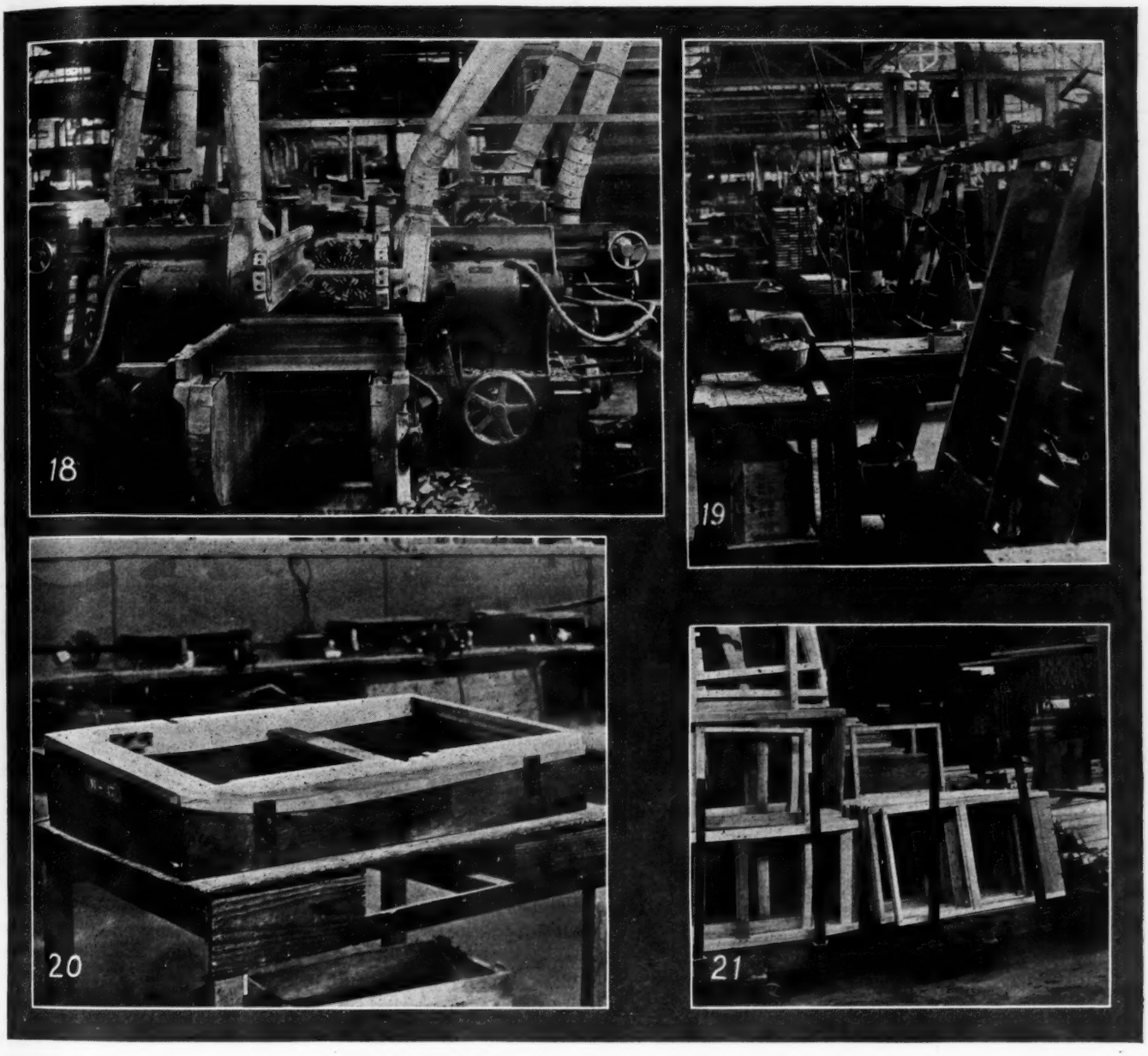


Fig. 18. Double end mortiser which prepares end of pieces for later points. Fig. 19. Door frame assembly fixture. Thor and Van Dorn electric drills are used to drive screws. Fig. 20. Final inspection fixture for closed body door. Door is checked for outline and contour of molded surfaces. Fig. 21. Finished door frames and component parts on truck which are used throughout the plant

small pieces such as brace and corner blocks. In every case the holes in the piece which contains the upper part of the wood screw are machine drilled so that it is only necessary for the parts to be assembled and follow this by the application of the wood screws. In this way an unusual degree of uniformity is obtained.

UNDER plans formulated by the Citizens Child Safety Committee of Chicago, every child in the city will receive each month during the coming year a beautifully colored "A B C Song Book" containing an "Always Be Careful" song and a colored illustration of one of the twelve safety commandments appearing on each song book. The unique safety campaign is being financed by reserving the back cover of the song books for advertising, the space being sold to local merchants and national concerns who desire to lend their support. The books will be distributed through stores and schools, making them available in every community in Chicago. The children are being told about the song books by Chicago radio stations and newspapers.

The campaign was explained to a number of prominent automotive men recently by Vincent Bendix of the Bendix Brake Co., during a speech at a special luncheon in Chicago of the 500 Club, of which he is president. Mr. Bendix asked the members of the Club to lend their support to the movement.

One of the prominent members of the Club, Oliver G. Temme, is chairman of the committee, and is giving practically his whole time to this work. All the members of the Club on Automobile Row, Chicago, have subscribed for copies of the song books. Harry Branstetter, treasurer of the 500 Club, Gregory Flynn, secretary, and William T. Morris of the American Chain Co. are interested in the plan.

Automobile Financing—from a *Banker's* Point of View

Manufacturers can best protect themselves from evils of present situation by exercising closer supervision of risks. Rates should be lowered as service to buyer.

By Oscar F. Meredith

Assistant Cashier, The Bank of America, New York

WITH several billion dollars of unpaid-for merchandise in the hands of the public and some of it unquestionably financed without sufficient security, bankers and far-seeing business men have begun to view the phenomenal growth of time-payment sales with some alarm.

No one questions the soundness of the time-payment idea. It has been employed successfully for years. But in the rapid expansion of instalment buying certain abuses have arisen in practice which cannot be ignored. The fact that the finance houses weathered the business depression of 1920 and 1921 showed a fundamental strength of these institutions, but it can hardly be taken as a criterion of what would happen in the event of future financial distress.

The amount of instalment paper outstanding today is far greater than it was four years ago and the entrance into the field of many concerns, lacking sufficient capital and officered by men of limited financial experience, has materially changed the situation.

If instalment buying has become an evil—and there are many who think it has grown to be—it is due to abuses in the practice of financing all types of commodities, not alone the automobile. Be it said here that this fact is sometimes forgotten when criticism is leveled at the automobile manufacturer. But granting the fact, the importance to the automobile manufacturer of finding correctives is in no wise lessened, rather increased. He is vitally concerned in keeping automobile paper sound because so large a proportion of his sales depends on the uninterrupted flow of credit.

The most obvious and perhaps the most discussed abuse in automobile financing is the deviation from recognized sound practice in the acceptance of cash payments and the granting of terms.

Competition between finance concerns in an over-crowded field—the need to get volume business—has in many cases lowered the cash payment and extended terms to a point where the value of the car is considerably less at any given period than the amount advanced. Again, to keep payments of the balance within the twelve month period finance houses sometimes resort to the practice of "ballooning" the twelfth note, that is, the twelfth note is made to represent, say, 25 per cent of the purchase price. If the last note is not paid at maturity the finance concern arranges for three to six additional notes of equal amounts and makes an additional service charge. In both cases the desired result—that of getting business by making time-payments attractive—is achieved at the expense of safety and security.

Much automobile paper outstanding today is of the recourse type, that is, it bears a dealer's indorsement, and while no attempt will be made here to discuss the relative standing of recourse and non-recourse paper, concerning which there is a great diversity of opinion among bankers and finance companies, it may be said that a dealer's indorsement has a more or less problematical value. The heavy mortality rate of dealers and the small capital on which many are known to operate (made evident by the fact that three-hour financial service often becomes imperative), precludes the banks from placing any great confidence in indorsements unless the financial backing is known to them.

While credit investigations are made of individuals buying on the instalment plan, these investigations are far from searching. It has been the experience of banks that a thorough credit investigation costs from five to fifteen dollars.

Assuming for the moment that the minimum cost of an investigation is five dollars per car, let us see what the total yearly cost of investigating the credit standing of time-payment buyers should amount to. The output of passenger cars this year will approximate 3,600,000 and about 15 per cent will be exported, leaving 3,060,000 cars of which fully 75 per cent will be sold on the instalment plan. The cost of investigating the buyers of this 75 per cent, or 2,295,000 cars, would involve an expenditure of $11,475,000, not to mention the cost of investigating used car buyers which would entail several million more dollars.

Here, then, is an indication of the superficial manner in which investigations are being made, for no such staggering sum is being expended.

It is pertinent at this point to ask if finance concerns know when a buyer is heavily involved in other instalment purchases? Do they know whether a bill of sale represents the actual price of the delivered merchandise or do they permit an abuse such as the billing for accessories which are retained in lieu of a cash payment? Do the banks know

HAVING spent many years handling credit operations in automotive and other lines in the East and Middle West, Oscar F. Meredith, the author of this article, is qualified to express a banker's point of view of present financing practices.

He holds that instalment buying has become an evil because of abuses in the financing of all types of commodities but that it is imperative for manufacturers to keep automobile paper sound so that credit facilities will be available at all times.

He believes that automobile financing is fundamentally a service proposition and he looks for improvement in instalment selling practice when its true function is recognized by manufacturers.

when a twelfth note has been ballooned? Frankly, they do not. At present it is practically impossible for banks to know the exact conditions surrounding underlying collateral for their loans and this tends to weaken the confidence in automobile paper.

The banks are not altogether free from blame for the growth of time-payment evils. They have been attracted by the quite satisfactory discount rate on automobile paper and have supplied the funds used by finance concerns. They will continue to handle automobile paper, but unless abuses in financing practice are corrected, they may be forced to curtail loans.

The Manufacturer's Problem

The problem before the manufacturer, then, appears to be how to exercise such supervision over the financing of his cars as will assure unimpaired credit facilities. To this end it seems advisable to have the financing done by concerns closely affiliated with the manufacturing side of the business. Some of the advantages to be derived from the affiliated concern are:

1. Closer supervision of risks.
2. Lower financing charges.
3. Utilization of manufacturer's surplus funds.
4. Community of interest.

Few will deny that a closer supervision of risks and lower finance charges are things to be desired, but many will protest the use of manufacturers' surplus funds for financing.

It will be said that financing and manufacturing should be kept apart; that no practice is sound which would permit the financial weakness of the one to affect the other, and that the absence of need to earn money in financing would be harmful. Such objections would seem to arise from a misconception of the primary function of financing.

In the last analysis, is it not fundamentally a service proposition?

From the manufacturer's standpoint financing serves no other purpose than to place cars in the hands of owners. In that respect it is a service to the manufacturing side of the business. The distribution of parts for servicing cars in the hands of owners is also a service to the manufacturing end, although less direct. But no one supposes that the manufacturer would jeopardize his business by unsound practice in the distribution of parts.

Striving for Lower Costs

Once the conception of financing as a service proposition prevails we should find manufacturers striving to have financing operations conducted at the lowest possible cost commensurate with sound business practice. Indeed we are already witnessing a movement in that direction. The policy of supervising risks more closely, making lower costs possible, and the educating of the public to the actual cost of instalment buying, both tending to reduce the number of buyers who are not legitimate purchasers, should bear fruit and do much to maintain confidence in automobile paper.

Of the immediate steps which might be taken which would work toward improvement in instalment buying conditions, the following might be mentioned:

1. Demand a one-third cash payment and balance in not more than 12 equal monthly payments for new cars, and a one-half cash payment and balance in six equal monthly payments for used cars.
2. Insist on dealers having adequate capital and sell them on open account up to the proper amount.
3. Insist on closer supervision and investigation of buyer's credit and eliminate poor risks.
4. Greater insistance on the part of both banker and manufacturer that dealers finance sales only through concerns of proven financial standing and experience.

Too much stress cannot be laid on the need for closer cooperation between automobile manufacturers, finance concerns and banks. These three groups have a common interest in maintaining the soundness of automobile paper, for no one group can suffer reverses without the others being affected. Concerted action taken now to adopt sane policies will do much to put instalment selling on a firm foundation from which it cannot be overthrown by any future business depression.

Gary Urges Preparedness

"WE view with apprehension the possibility that national defense may become the football of politics in the forthcoming session of Congress," stated Elbert H. Gary, chairman of the United States Steel Corporation and chairman of the Advisory Board of the New York Ordinance District in his remarks as presiding officer at a meeting of engineers on December 4 that was devoted to a discussion of industrial cooperation with the War Department.

Continuing, Judge Gary added, "The statesmanlike report of the Morrow Board should put an end to controversy. All concerned have had their day in court and in a spirit of fairness should abide by the referee's ruling." In the course of his remarks he commended very highly the efficiency of the War Department in its peacetime activities, especially those that are carried on in cooperation with industrial agencies for the promotion of industrial preparedness—the most potent form of insurance against war.

Speaking of the War Department as a vast business organization, Secretary of War Dwight F. Davis briefly summarized the diversified interests of the department and showed how they are made most effective in promoting the country's welfare. He called for the solid backing of all loyal Americans in the organization of effort to "prepare against war and to guarantee an honorable peace, a righteous peace."

General James G. Harbord, president of the Radio Corporation of America, in responding to the plea of Secretary Davis gave assurance that American industry is pledged to uphold the best interests of the nation and stands ready to devote its energy toward the solution of any problem that may arise.

Included among the speakers at the meeting in the Engineering Societies Building, New York, were Assistant Secretary of War Hanford MacNider and Major General Charles P. Summerall, commanding the Second Corps Area. President Calvin Coolidge sent a telegram conveying greetings and best wishes. The six engineering societies by which the meeting was arranged, in cooperation with the Army Ordnance Association, were commended for their aims and interest.

ABOUT a year ago an assembling branch was established by the Ford Motor Co. at Port Elizabeth, Union of South Africa. The plant has a capacity for assembling forty cars per day. Recently a lot of 400 cars was shipped from there to Singapore, which was due to the fact that the cars were needed by a certain date and neither the Detroit nor the Canadian Works could deliver them in time. At the Port Elizabeth plant the cars are assembled from parts shipped from America and are painted and upholstered.

Steam Cooling's Greatest Handicap is Its Name, Says H. C. Harrison

Advantages of system outlined in paper before Detroit Section of S. A. E. Heats engine three times as fast as a water cooled system and stays warm six times as long. Three types described.

THE greatest impediment to the adoption of steam cooling is the name, which has given the system a black eye for the past seven years. While the defects of present water cooling systems have long been recognized, engineers have been deterred from the use of the evaporative system by a name which has suggested all sorts of dire consequences. Apparently it remains for some clever publicist to originate a clever, pointed name which will surmount the present psychological barrier. Careful analysis points to but one possible defect in the so-called steam cooling system and provisions for overcoming this fault already have been developed.

These were the outstanding thoughts in the paper, "Steam Cooling," which was presented before the Detroit Section of the Society of Automotive Engineers at the Dec. 3 meeting by Herbert C. Harrison, president of the Harrison Radiator Corp.

That the subject is one of live interest was attested by an attendance figure exceeding 300. Capt. L. M. Woolson, of the aeronautical department of the Packard Motor Car Co., presided and the discussion, which was brief, was joined in by T. J. Little, Jr., president-elect of the society; Frank E. Watts, chief engineer of the Hup Motor Car Co., and W. R. Griswold of Packard.

Mr. Harrison deprecated the misnomer of steam cooling, asserting that the steam formed in the evaporative process has nothing to do with the cooling but is only a product and, due to its latent heat, a convenient vehicle for the excess heat which must be thrown away or lost at the radiator or condenser. The conventional water cooling is subject to a number of limitations which have been recognized since its earliest use. The cooling medium boils away at 212 deg. Fahr. and in winter operation, alcohol, which is the ordinary anti-freeze liquid, boils off at temperatures as low as 140 deg. The latter figure is not satisfactory and introduces the troubles incidental to crankcase dilution. Due to the inherent characteristics of water cooled systems, engineers send cars to Arizona and Texas and the southwest and finally settle upon an arrangement which is satisfactory in those localities. This results in a cooling capacity which is used but rarely and is away oversize for winter driving in the north.

Not a New Development

Evaporative cooling is not a new development but has been used for many years in hopper cooled stationary engines with great success. If appearance, which is one of the most important sales factors, could be overlooked, the same system could be applied to automobiles. However, a high stack which will act as a condensing column is somewhat out of place in the modern conception of the automobile.

Throughout his entire talk, Mr. Harrison emphasized repeatedly that there is but little distinction between steam and water cooling in so far as the make-up of the power plant is involved. Any detail of design which improves operation with water cooling will show similar advantages when steam or evaporative cooling is utilized. This statement applies to the elimination of hot spots at the cylinder heads, the removal of steam pockets and free circulation of the cooling medium. In a similar way, he stated repeatedly that water is the cooling medium in either case, but the evaporative system utilizes the characteristics of the product, steam, to place the cooling system under what amounts to thermostatic control. It is just a problem of getting rid of the heat in the cooling medium and returning the cooled fluid to the water jacket. And the same process holds good when alcohol is used to prevent freezing. While the alcohol may boil at lower temperatures, it is condensed and returned to the system with no loss.

Alcohol Only a Palliative

In the ordinary water cooled system equipped with thermostatic shutters for winter operation, alcohol is only a palliative. As long as any attempt is made at retaining the alcohol, the engine cannot run at the correct temperatures for best performance as regards fuel, oil and maintenance.

Three types of evaporative systems were described by Mr. Harrison. In the first, an adaptation of the present water cooling system is used. Instead of venting the radiator at the top, the overflow pipe is connected to the bottom tank. Wet steam and liberal quantities of water are transferred by a centrifical pump. This system works fairly well, but is subject to limitations, particularly when the engine is shut down suddenly after a long, hard run.

In the second arrangement, water and steam are transferred from the engine to the lower tank of the radiator. This system has some bad drawbacks. The water level in the lower tank must be kept below the lower end of the core. Further, as the steam ascends in the core, it interferes with the descent of the condensed water and in some cases where a slight steam pressure is developed will force the water in the core into the upper tank of the radiator. Pressures which will force the cooling liquid out of the overflow can be developed in this system.

In the third arrangement, which differs more largely from present practice but which is still operative as a water cooled system, water and steam from the engine are delivered to a tank at one side of the radiator, the connection being about two-thirds of the way up the height of the radiator core. Cross passages are used in the radiator and the cold tank is at the opposite side of the core with the outlet to the pump at the bottom. The overflow or air vent is connected with the cold tank. An auxiliary top tank is installed above the core and a small portion of the upper part of the core serves as an auxiliary condenser.

This auxiliary condenser is installed to prevent loss

after the engine is stopped suddenly following a long hard run. The residual heat of the block is transferred to the coolant when the fan and pump are not operating and therefore tends to develop a considerable amount of steam. To absorb this steam without loss, the hot side or tank of the radiator is vented through a water seal to the auxiliary tank and any excess is passed down through the auxiliary core passages and down into the system.

With this arrangement another advantage is obtained even when operated as a water cooling system. When the alcohol boils, it is forced across the core before coming into proximity with the vent and overflow which is on the cool side. However, the passage across the core will condense the vapor into liquid so that no loss results.

Can Use Either Arrangement

Either of these three arrangements can be used in the three methods of steam or evaporative cooling. In the first or sub-atmospheric method, a vacuum pump must be used on the cold side of the radiator. In the second or super-atmospheric method, a pressure relief valve must be placed on the cold side of the radiator. Both of these methods entail complication. Moreover experiments have demonstrated that 212 deg. is about the most efficient operating point for engines of present day design when all things are considered. At 225 deg. some troubles are experienced while at 250 deg. a great amount of trouble arises, so great as to eliminate the consideration of this temperature.

Mr. Harrison reviewed many of his experiences with elaborate steam chests and injector systems for returning the water which was separated from the dry steam and stated that his experience along this line had led him to the recognition of the third method which operates at atmospheric conditions with a boiling point or control point of 212 deg. at normal levels. In this system a liberal amount of water is pumped over with the steam and no attempt is made to separate the two. Furthermore, this system is the nearest to present day practice and therefore the most expedient.

In outlining the advantages of the evaporative system of engine cooling he advanced several points which follow:

1. The engine comes to a constant operating temperature in a much shorter period and this condition continues constant in spite of weather conditions.
2. Crankcase dilution is eliminated due to the constant high wall temperatures.
3. Anti-freeze solutions, chiefly alcohol, are not lost in the evaporative system.
4. If frozen due to the absence of anti-freeze solution, the system is self-thawing.
5. Part throttle economy in cold weather is much better due to the constant high operating temperature.
6. Oil economy is improved.
7. The same carbureter setting is retained in winter and summer.

No Difference in Power Output

In addition to these, he stated that practically no difference in the horsepower output of the engine is indicated by the two systems and that radiator leakage can be almost forgotten even if the core is slightly damaged. He spoke of a case where one of his experts had jabbed holes in a core to demonstrate the last point and his reason was that water tends to run off of a slightly leaky umbrella instead of projecting around to find holes to go through.

Lantern slides covering an elaborate set-up to determine the temperature differences in the block under conditions of steam and water cooling were shown. The results in every case showed much less variation with the steam cooling set-up.

Mr. Harrison designated ten points which should serve as guideposts in the design or adoption of a steam or evaporative cooling system. The sense of these is contained in the following:

1. Water is a non-conductor and serves as the carrier of the heat developed at the cylinders and should be circulated rapidly.
2. The maximum temperature drop should be obtained through the core. This involves the temperature drop of the air which is passed through the core.
3. The water need not be cooled below 175 deg. and should be circulated rapidly. A centrifugal pump is superior to any depending upon mechanical fits.
4. There should be no air lock on the cold side of the radiator, which should be vented.
5. Provision must be made for disposing of the residual heat which develops after the engine is stopped.
6. There should be no loss of water or alcohol.
7. The efficiency of the system depends upon the rate of steam circulation.
8. The air flow and the temperature rise through the core depend upon the amount of air passed through the core.
9. The steam cooling system must go on the conventional car.
10. The steam or evaporative system must be able to run as a water cooled system.

Engine Design Not Affected

In reply to questions arising during the discussion, Mr. Harrison stated that when an engine was properly designed to give good results in summer operation with water cooling, it will operate satisfactorily when steam cooled. The advantages of evaporative cooling are not as great for aircraft operation as for cars, tractors, etc., due largely to the tremendous volumes of water and air which are transferred in aeronautic practice. Where the steam and water are separated and only dry steam is passed through the core, the core size can be reducted 33 per cent. However, he advocated the simpler system which handles more water and requires a core only slightly smaller than the proper core for correct water cooling.

Due to breaking the water seal when the engine stands, no transfer of heat from the warm engine to the radiator occurs. Owing to this condition he estimates that a steam cooled system cools off six times as slow as a water cooled system, and on the other hand, warms up three times as fast.

New Wrenches of Alloy Steel

A NEW line of wrenches of chrome molybdenum-steel has been introduced by J. H. Williams & Co. of Buffalo, N. Y. It will be known as the "Superrench" line and will supplement the company's drop-forged wrenches of carbon steel. The superior mechanical properties of the alloy steel make possible the manufacture of wrenches of lighter section and lower weight.

These new "Superrenches" are now available in four styles, all heat-treated, as follows: Engineers' pattern, double head, 15 deg. angle openings General Service "S" pattern, 22½ deg. angle openings (both of these in nickel-finish, with heads buffed bright); construction pattern, single head, 15 deg. angle opening, and Structural pattern, single head, straight opening, offset handle.

The Construction and Structural patterns have a tang at the end of the handle for bringing bolt holes into line. They are given a silvery gray finish which prevents rusting in outdoor service.

Fleet of Air Mail DH-4 airplanes similar to the types upon which the maintenance figures in this article are based

Airplane Maintenance Costs—How to Estimate Labor and Materials

Depreciation, engine not included, is estimated as 25 per cent a year for machines in commercial service. Air Mail data studied.

By Archibald Black

Consulting Air Transport Engineer

THE engineer who is called upon to prepare an analysis of the cost of operating transport airplanes is brought fact to face with a number of unusual problems. Not the least of these is the question of the cost of keeping the airplanes in condition for service.

To those who have not been associated with the actual operation of airplanes on a large scale these costs are very much of a closed book. No operator is very ready to give out information and he probably could not give it even if he would. For the average operator is too greatly concerned with the means of getting business to be willing to devote any time to making studies of how his operating costs are divided.

When we prepared our first air transportation operating cost analysis, a few years ago, this item was one of a fairly imposing list which called for careful attention. After a survey of possible sources of information which might be available either here or in Europe, we came to the conclusion that the U. S. Air Mail Service, for which the writer was then acting as Consulting Engineer, and certain other operators with whom he was in close contact, represented the most promising sources of reliable data.

At this point it is perhaps well to mention that the U. S. Air Mail cost records—which are widely published and readily available—represent totals for certain conditions of operation. They cannot be taken just as they are grouped and applied directly to an airplane operating under totally different conditions. The Air Mail, being a Government enterprise, operates under conditions which are necessarily very different from those to be met in the operation of a commercial airplane of the same size.

On the other hand, the figures of commercial operators in the United States are also of limited value because of the relatively small scale of their activities. The problem, thus, resolved itself into one of going through the Air Mail records, separating out just the figures with which we were concerned and combining these with the commercial operators' experience.

Some conferences with executives indicated that our information could best be obtained by going right down, in each case, to the original sources—the personnel in actual charge of repair and maintenance work. This policy was followed and the results of the investigations, as corrected to date, are summarized herein.

First, the actual frequency with which the airplanes were being put through the shops for repairs due to "crashes" was determined on the basis of the U. S. Air Mail experience. This figure was directly available from the regular records in a form applicable to the average condition. We then created five classes in which to analyze our airplane maintenance costs:

1. Case where the airplane is taken out of service for a short period merely to have its engine changed.
2. Case where minor repairs and adjustments can be made without taking the airplane out of service for any time whatsoever.

3. Routine overhaul or rebuilding of airplane which is carried out on the basis of a scheduled mileage flown.

4. Wreck of airplane resulting in only repairable damage.

5. Wreck of airplane entailing the writing off as a complete loss of airplane and equipment after allowing for salvage of certain few parts which could be safely used again.

As the airplane engine represents a separate and rather different problem, it has been given separate treatment in a previous article.

In analyzing the various costs along the lines of the above tabulation, case (1) was temporarily disposed of by transferring it to the accounting covering engine maintenance. This assignment is only proper as the incidental cost due to the changing of an engine should certainly be charged against the engine which is the primary cause of the airplane being in the shop. Case (2) was disposed of somewhat similarly by including the labor and material charges for minor repairs with the labor and material charges incurred in what we termed "servicing" of airplanes and engines. This heading covered all of these charges or other costs incurred in actually handling airplanes in regular use, in servicing of these with supplies, starting up and warming engines, making minor adjustments, etc.

As no definite line can be drawn between servicing and such minor repairs as the renewal of spark plugs the logic of this assignment of "minor repairs and adjustments" should be unquestioned.

Getting down to items (3) and (4), we determined, on the basis of the Air Mail experience, the relation between mileage flown and the frequency of these items. Following this, two experienced airplane maintenance shop managers were asked to prepare fully detailed lists of the specific work done on the average airplane routed through their shops. These lists were prepared independently, were later compared and were found to be within reasonable agreement.

From the two lists a composite list was then prepared and sent back to the two men mentioned with the request that they each estimate the actual labor hours and actual material cost necessary to accomplish the work listed.

To ensure thoroughly the reliability of our data we took copies of the same list (of specific items of work to be done) to two airplane construction superintendents with extensive construction and estimating experience. These two men, again working independently, furnished us with their own estimates of the man hours of labor and actual material cost necessary to complete the work listed, under the conditions in their own shops. All four estimates were assembled in parallel columns and, upon comparison, showed very reasonable agreement.

All four estimates were then averaged and the figures given herewith in Tables (1) and (2) represent the results. It should be particularly noted that these figures are direct labor hours and actual material costs only and that they include no overhead of any kind. Rent, light, heat, power, transportation, supervisory payroll, etc., must be separately and completely estimated. We used this method of analyzing costs because we found it to be more practical than that of attempting to include all of these costs "en masse."

Indeed, it is the only practical method at this time. It is senseless to take some arbitrary factor and use it as a multiplier to include overhead. At this stage of air transport we have nothing to base such a factor upon.

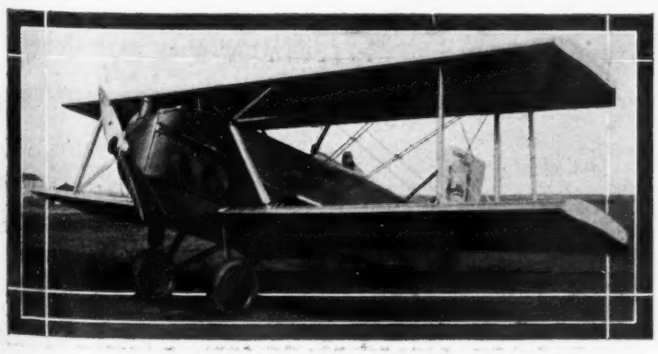
As regards case (5), the actual method of figuring the loss due to what operators term "washouts" is closely tied up with the method used in allowing for depreciation. If the depreciation is to be written off on a rational, businesslike basis, airplanes and engines must be clearly separated

Table 1—Scheduled Airplane Rebuilding

[After every 500 hours of flying each airplane is given a thorough overhaul and rebuilding. The following figures represent the actual experience of substantial American operators in average man-hours of labor and actual material cost. No overhead or other indirect charge is included. For very small scale operations slightly increased allowances should be made].

Item	Labor in Man-hours	Material Cost in Dollars
20 per cent recovering and doping of wings and tail surfaces	19.20	$42.00
Wing and tail partly rebuilt	30.00	50.00
Fuselage repair work including radiator repairs	64.00	200.00
10 per cent landing gear and tail skid parts replaced. (Parts figured as purchased ready made)	8.00	45.00
33 1/3 per cent propellers replaced or repaired. Included with assembly		50.00
20 per cent control wires, etc., replaced. (Wires and parts figured as purchased made up)	1.00	16.00
10 per cent wing struts, wires, etc., replaced. (Parts figured as purchased ready made.) Included with assembly		22.00
25 per cent complete disassembly, reassembly and adjustment, including installing of parts listed as replaced.	56.00	5.00
Engine running test (about ½ hour)	4.00	6.00
Inspection and truing up	6.00	
Complete cleaning	4.00	1.00
Totals	192.20	$437.00

Copyright, 1925 by A. & D. R. Black, Garden City, N. Y.



Curtiss "Carrier Pigeon," a recent design to which the accompanying costs would apply with little modification

Table 2—Airplane Wreck Repairs

[After every airplane crash (which does not require the writing off of the machine), a list of repairs will be necessary to place it in serviceable condition. The following represents the actual experience of substantial American operators in average man-hours of labor and actual material cost. No overhead or other indirect charge is included. For very small scale operations slightly increased allowances should be made].

Item	Labor in Man-hours	Material Cost in Dollars
Complete recovering and doping of all wings and tail surfaces	96.00	$210.00
Wings and tail partly rebuilt	36.00	35.00
Fuselage partly rebuilt	72.00	150.00
50 per cent of control wires, etc., replaced (wires figured as purchased made up)	2.00	40.00
20 per cent of wing wires, struts, etc., replaced (parts figured as purchased ready made), included with assembly		44.00
Complete disassembly, reassembly and adjustment, including installing of replaced parts listed	224.00	20.00
Engine running test (about ½ hour)	4.00	6.00
Inspection and truing up	6.00	.....
Complete cleaning	4.00	1.00
Totals	444.00	$506.00

Note: Assembly included above allows about 16 man-hours and about $7.50 material cost for the installation of the engine.

Copyright, 1925 by A. & D. R. Black, Garden City, N. Y.

as being governed by totally different conditions. The useful life of an airplane engine is definitely related to the number of hours which it is actually in use in flight. On the other hand, the number of hours in flight has practically no bearing upon life of ordinary airplane provided that it is properly maintained. If subjected to regular and thorough reconstruction the ordinary airplane would last forever.

This seemingly peculiar state of affairs is very simply accounted for in the fact that the parts are constantly being replaced. Thus the airplane turned out of the rebuilding shop is, for all practical purposes, a new machine. However, the design of airplanes is constantly undergoing change and this tends to make the machine obsolete from the viewpoint of practical utility, although it might be put in perfect condition otherwise by reconstruction.

With such rapid development as is taking place at present, it would be dangerous to figure on any transport airplane retaining its usefulness for more than five years and caution would dictate the fixing of four years as a safer period on which to base any cost estimates. As a matter of fact, our own practice has been to figure depreciation due to obsolescence of the airplane and equipment (without engine) as a "straight" 25 per cent of the original cost per annum. Allowing for some salvage value and for the compounding of interest on the depreciation fund, this would actually write off the entire cost in about three years and a half.

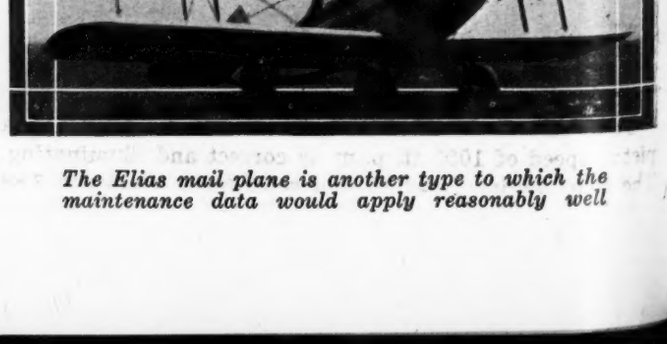
In estimating the loss due to "washout" of airplanes a sum equal to the average depreciation allowed to date must first be deducted from the initial cost of the airplane lost. This sum is dependent upon the frequency of "washouts" as well as upon the rate fixed for depreciation or obsolescence allowance. To avoid delving deeper into the intricacies of these fine points in this article, it may suffice to say that careful analysis pointed to 50 per cent as approximately the average depreciation likely to have been written off against cost of an airplane and its equipment at time of its "washout" in a crash.

It must be remembered that this figure of 50 per cent represents only a typical case for a present day airline. While close enough for use in almost any preliminary estimate, it is subject to considerable variation due to various causes.

On this basis we find that the loss becomes 50 per cent of the initial cost of the airplane before allowing for salvage. In most "washouts" a number of items of equipment and non-vital parts can be salvaged and used again without sacrifice of safety.

The salvage value of a wreck is subject to violent fluctuation and we have but little upon which to base any figures. After a study of this question and its discussion with many others concerned with the operation of airplanes, we fixed the somewhat arbitrary assumption of 5 per cent of the original cost as the average salvage value. This modest figure appeared to be well on the safe side. Thus the net loss, after deducting depreciation previously written off and the salvage value remaining, becomes 45 per cent of the original cost of the airplane and its equipment. As mentioned above, this does not include the allowance for the loss of the engine.

Another point which must be stressed with regard to the foregoing figures is that they apply to biplanes having wood and fabric wings, the same type of tail construction, and plywood bodies. For any other type of construction, such as the all-plywood or the all-metal (biplane or monoplane) the maintenance costs will vary. Such other types are certain to offer some reduction in the maintenance costs but our experience with them in the United States up to date has not been sufficient to justify the preparation of maintenance cost estimates paralleling those given here. Pending the availability of such properly comparative analyses, the foregoing figures should prove useful as they can be assumed to err on the high side for any other types of airplane than that from which they were obtained.



The Elias mail plane is another type to which the maintenance data would apply reasonably well

THE FORUM

Doubtful if Diesel Engine Ever Proves Suitable for Passenger Cars

Undoubtedly Has a Future, However, in the Heavier Fields of Motor Transport. A Letter to Forum and a Reply.

Editor AUTOMOTIVE INDUSTRIES:

I am delighted and disappointed with your issue of November 19. I am delighted that Mr. Clayden had the courage to speak as he has, and I am disappointed that your Editorial Department should seem to give encouragement to those who are following the ignus factuus of the Diesel automotive engine.

There are just two reasons why the Diesel automotive engine will never become universally adopted for automotive purposes. The first reason is that such an engine is a physical impossibility, and the second, that if it was possible, the public would not use it. A corollary to the last clause is that the excessively high pressures of the Diesel cycle are wholly unsuited to more than one-half the available fuel supply.

The supreme characteristic of an automotive engine is flexibility. The flexibility of the combustion engine depends entirely upon rapid flame propagation; and rapid flame propagation depends upon complete atomization in its most literal and scientific sense, *i. e.*, the molecules of the fuel must be disintegrated entirely into separate and distinct atoms of hydrogen and carbon, and these atoms must be brought into immediate contact with attached atoms of oxygen, which are taken into the engine in company with four atoms of nitrogen.

We constantly speak of atomizing fuel by spraying it and other mechanical means. There is only one agency that can atomize a molecule, and this agency in its popular sense is denominated "heat."

Mixture of Air and Fuel

The fuel being taken into the cylinder of an Otto cycle engine during the intake stroke, is intimately mixed with air and brought into closer contact by compression, during a period of time measured by a full revolution of the flywheel. In the Diesel type engine this period of time, instead of being measured by 360 deg., is limited to 15 deg. and the fuel, unatomized, is injected into a restricted area and not wholly diffused throughout the entire mass of the charge and for this reason it was stated above that a flexible Diesel automotive engine was a physical impossibility.

Your editorial statement that the Benz engine had a piston speed of 1050 ft. p. m. is correct and illuminating. The Benz engine to which you refer has a stroke of 7.88 in. and a piston travel of 15.76 in. per revolution. Therefore, its speed is limited to about 800 r.p.m., a speed equal to about one-third the number of revolutions of the cheapest automotive engine on the market.

The complication and expense of a fuel pump, the difficulty of starting such an engine, the malodorous and sticky fuel, the excessively high pressures that are so hard to maintain, seem to me to be sufficient to place the automotive Diesel engine wholly without the realm of possibility for general use. The speed, flexibility and economy of the automotive engine and it ability to burn lower grade fuels can be increased by atomizing the fuel wholly within the cylinder by increasing the time the fuel is subject to the high temperatures of compression before ignition and not by decreasing the time factor.

W. L. DEMPSEY.

We are inclined to agree with our correspondent's view that the Diesel engine will never become universally adopted for automotive purposes. No engine ever has been universally adopted for such purposes before, and none is likely to be in the future. In thinking of the Diesel as an automotive engine we must not think of the passenger car, for which it probably will never be used. The term "automotive" covers a number of applications other than to passenger cars, and in most of these flexibility of the engine is of less and low fuel cost of greater importance than in the case of passenger cars.

Probably the best angle from which to regard the future of the Diesel as an automotive engine is as follows: At the present time it is a great success as a marine engine, more than half of the world's shipping now under construction being motor (Diesel) ships. Starting with the application to a moderate-sized freighter in 1912, the field of the Diesel in marine work has been extended until today it is applied to ocean liners of more than 30,000 hp. and to submarines and chasers of only a few hundred horsepower. It also has been adapted to locomotives and rail cars, and a great deal of work is being done, particularly in countries where volatile fuels are relatively expensive, to adapt it for purposes where smaller units are required and where low weight and flexibility are of greater importance than in marine work. This problem undoubtedly is beset with many difficulties. But so was the development of the Diesel engine in the first place, and yet those difficulties were overcome to the extent that the engine is now

the preferred engine for practically all marine work. It seems to us inevitable that the Diesel engine will gain a field in land transportation, starting with locomotives and railcars, and working down toward smaller units. Just how far this development will be carried and how fast it will come will depend to a large extent on developments in the volatile-fuel situation, particularly in respect to prices.

The statement that the supreme characteristic of an automotive engine is flexibility is not absolutely true. An engine might be ever so flexible and yet, if it required a fuel that made the fuel cost, let us say, five times as much as it is with gasoline in the ordinary automobile engine, it would be of no use as a tractor engine or a railcar engine, whereas an engine lacking flexibility, but having a fuel cost of only, say, one-fifth that of the present automobile engine, might be a conspicuous success.

As far as the passenger car field is concerned, it is probably safe to forget the Diesel, for the present at least.—EDITOR.

Diesel Engine Efficiency

Editor AUTOMOTIVE INDUSTRIES:

In your editorial comment of November 19 on "The Diesel Automotive Engine" there are some items which, I believe, should be given even stronger emphasis than you have given them.

Since some locomotive Diesels are reported to be running pistons at 1200 ft. p. m. the automotive compression-ignition engine difficulties stand out more clearly, perhaps, if represented in terms of r. p. m. It is noteworthy that thus far the most advertised attempts at automotive and aircraft Diesels, operate at only from about 800 to 1200 r. p. m. When only an exhibition of r. p. m. is desired we can run up over 2000 r. p. m. with smooth mechanical functioning. But—the pinch is to obtain simultaneously high r. p. m., good capacity, and attractive fuel economy. Combustion chamber processes are, in that connection, the worst obstacles. Reports, therefore, of foreign achievements may well be given only cautious acceptance.

Creditable as is 1200 r. p. m. there are some of us who don't believe 1200 r. p. m. is going to get us far towards satisfactory *commercial* efficiency. Personally, I think we should not lean back till we have doubled that r. p. m. If it can be done with two-cycle operation, so much the better. Scavenging air conditions at that speed may, however, prohibit two-cycle operation.

In speaking of the formation of the combustible charge, your statement "the first 10 per cent or so of the *power* stroke" (the italics are mine), lets the spectators down rather gently. Some power plant oil engines of 200 to 300 r. p. m. run up maximum pressures of around 600 pounds per square inch. Abroad, where fuel economy demands closer attention, there are engineers who claim that good fuel economy from airless injection at small power plant speeds, runs into maximum pressures of over 800 pounds. But taking only 600 pounds as a maximum at 250 r. p. m., the pressures that may occur when the r. p. m. is increased from five to six times, with injection early enough to give comparable fuel economy, become interesting if not always enticing. The engineer who succeeds in rounding, as desired, the peak of the card from an oil engine running at 1400 to 2000 r.p.m., will do the automotive industry a fine service.

Intruding the personal opinion once more, I don't believe the present miniatures of marine and stationary Diesels are going to give us what we are looking for. Nor will some of the other more complex designs attain to the required commercial efficiency. When some research on fuel characteristics, now being advocated, is undertaken, the limiting r. p. m. with the airless injection engine, will, it is hoped, be more definitely determinable. These findings may point to the defeat of our hopes that mechanical ingenuity will be able to give us a high-speed compression-ignition engine with the maximum gas pressures of today.

ROBERT MATTHEWS, M. S. A. E.

A Fuel Test Suggestion

Editor AUTOMOTIVE INDUSTRIES:

After reading the article by A. L. Clayden, "Anti-knock Properties of Gasoline Depend on Cracking," in your issue of November 12, it occurs to me to suggest the following:

The magnetic polarimeter shows a distinctively higher rotary power for the benzene group than for the napthenes, and the latter a higher rotary power than the paraffins. Hence the rotary power is, approximately, inversely proportional to the knocking properties.

The variation in rotary power is very distinctive when comparing the benzenes with the paraffins, that of benzene (C^6H^6) being 0.000550 as compared to 0.000211 for normal pentane. The rotary power of the napthenes is not so markedly different, as it is but 0.000226 for cyclo-hexane. The figure is Verdet's constant.

This method is a very convenient one, and requires but a moment to make the determination. It would be expected to show a higher rotary power for gasolines rich in benzenes and napthenes, and a lower rotary power in proportion as the content of paraffins increases. In confirmation of this, I may point out that a sample of California gasoline showed a rotary power of 0.0002524 as compared to 0.000234 for an Atlantic gasoline and 0.0002125 for a sample from Borneo.

My suggestion is, therefore, to compare the magnetic rotary power of the gasolines with the results of tests by means of the Midgely apparatus.

While the set-up of a powerful magnetic polarimeter is rather elaborate, the rapidity and the accuracy with which determinations may be made is very much in favor of the use of such an instrument, provided the results are a reliable index of knocking properties.

E. W. ROBERTS.

WITH the recent appearance of a new model 10 hp. Citroen, every French automobile manufacturer now uses four-wheel brakes. The Citroen is a modification of the chassis which has been in production since 1919, having a special front axle, semi-elliptic front springs in place of quarter elliptics, and new frame members. The mechanical front wheel brakes are cable operated by a brake camshaft mounted on the axle itself. With four-passenger phaeton body and balloon tires the new Citroen sells at 21,500 francs.

The first to get into big production after the war, with a car having been designed during 1917 and 1918, Citroen was unable to follow the move towards front wheel brakes as rapidly as other French manufacturers, and because of this he has been at a disadvantage during the past two years, for rival firms, Renault in particular, have directed an active campaign against all cars not equipped with four-wheel brakes. To make the change over to front brakes it was necessary, in addition to a new and stiffer axle with closed eye ends and inclined steering pivots, to abolish the quarter elliptic front springs in favor of semi-elliptics, and this involved changing the chassis side rails. The small 5 hp. Citroen remains as before with a transmission and rear wheel brakes.